



Charles E. Kellogg

E U R O P E A N J O U R N A L

Charles E. Kellogg

1950

Table of Contents

June		Page
24	Leave for Europe	2
25	Shannon, Galway, Eire	3
26	Galway, Connemara, Dublin	5
27	Kells, Ballyhaise, Ballinlough	12
28	Dublin and to Wexford	17
29	Johnstown Castle and Wexford to Cahir	22
30	Cahir, Mitchelstown, Cork, Munster, and Clonakilty	30
July		
1	Cork, Blarney Castle, Killarney	33
2	Mallow, Charleville, Shannon, London (U.K.)	36
3	London to Portugal	40
4	Lisbon, Estoril, and north	41
5	Lisbon, Sacavem	44
6	Lisbon, Arrabida, Setubal, Franca de Xira	46
7	Lisbon, Sacavem	51
8	Estoril, Sacavem, Lisbon	53
9	Lisbon, north and went into Spain by train	54
10	Alsasua, Zumarraga, San Sabastian, Hendaye (France), Bourdeaux, Paris	61
11-18	Paris	65
19	Paris to Brussels	79

July		Page
20-21	Brussels	80
22	Brussels to Amsterdam	84
23-26	International Congress of Soil Science	85
27	Field excursion to Gooi-region and Noordwijk	91
28-Aug.1	International Congress of Soil Science	93
2	Amsterdam to Groningen	97
3	North of Groningen. Reclamation of tidal lands	98
4	Near Groningen. Reclaimed peat area. Emmen. Man-made soils	101
5	Near Groningen. North Eastern Polder and "Island of Kampen"	105
6	Groningen to Wageningen	111
7	North of Wageningen (Veluwe) Sandy soils	112
8	Near Wageningen. North Limburg and Rijk van Nijmegen (River deposits)	116
9	Near Wageningen (Betuwe) (Fruit growing area). Then to Breda	121
10	Breda and Walcherin Island	127
11	Breda and Westland	131
12	Breda. Brobant (Sandy soils)	139
13	Breda, Antwerp, Brussels, Ghent (Belgium)	147
14	Near Ghent	149
15	Ghent, "Land of Aalst," (rounded fields), St. Nicolas, Louvain	152

August		Page
16	Near Louvain	160
17	Louvain, Liege	166
18	Liege, Abee-Scry, Namur	168
19	Near Namur, on to Brussels	173
20	Brussels and to Harpenden	177
21-28	Harpenden and London	178
29	London to Reykjavik, Iceland	187
30	Near Reykjavik	189
31	Reykjavik, Hveragerdi, Selfoss, Hella, Samsstadir, Mulakot	195
September		
1	Mulakot, Keldur, Selfoss, Thingvellir, Reykjavik	206
Report to Minister of Agriculture, Iceland		212
2-4	In Reykjavik	221
4-5	Reykjavik to Hyattsville	226
Statement on fertilizers in Holland		
Published <u>Notes from European Field</u>		

EUROPEAN JOURNAL

1950

The Department of Agriculture arranged that I should attend the Fourth International Congress of Soil Science in Amsterdam as Chairman of the United States Delegation and, on the same trip, accept invitations to visit soil scientists and agricultural administrators in other countries.

This Journal covers the entire trip in Ireland, Portugal, France, Belgium, Holland, England, and Iceland. It does not include the texts of the proceedings of the Congress nor of the excursion guides, since these are easily available in print. The excursion guides especially need to be used in reading the part of the Journal that reviews the excursions of the Congress.

The Journal is a record of notes taken on the spot, often in great haste. Probably there are errors. Some of the opinions formed at the time may be changed with further information and reflection. Since secretarial service was unavailable, detailed records of many conferences, especially at the Congress and with government officials, are lacking.

These notes are not to be quoted except with permission in writing.

(Besides the black-and-white pictures, a set of kodachrome slides is on file.)

ROUTE MAP
EUROPEAN JOURNAL

1950



June 24

I leave Washington with Mrs. Kellogg at 9:10 a.m. This plane is late and I have been warned that the one from New York may be late. We only get to the end of the runway and then return because of a bad wheel. I hope this bad start is not an omen. After several delays, we finally change planes and leave the airfield at 11:05 a.m. We are down in New York City at 12:00 noon and transfer to the International Airport of New York, where we find the plane scheduled to leave for Shannon at 2:00 p.m. is now set up for 9:00 p.m. There is nothing for it but a long wait. We are finally in the air for Europe at 10:10 p.m. EST. This day changes into the next in darkness.

June 25

Although we were scheduled to land at Gander, instead we land at Goose Bay about 2:30 a.m. The airport seems to have been built on a plain of sandy soil with a thin peaty surface. There is a thin stand of spruce at the margins. The airport is cold and no coffee is to be had. We are back in the air again at 4:05 a.m. EST. Because of a headwind, we steadily lose time.

Shortly after 6:00 p.m. GNT, we come up along the Shannon River and we land at the Shannon airport at 6:32.

We are met by Mr. Luke Mannion, an associate of Dr. Walsh in the Irish Ministry of Agriculture. After a leisurely lunch, we start for a field trip to Galway, in a tiny car with four big bags.

One is immediately impressed with the tiny fields and the many hedges. Most of the land is in meadow and small grains, without real good management. The shrubs in the fence rows rob a good deal from the soil. The soil is said to be developed from carboniferous limestone with a suggested karst topography. Much of the soil is brown, thin, and stony.

We stop to look at some oats having definite symptoms of manganese deficiency on what is called locally a "brown Rendzina" with a high pH. There is a good deal of discussion of the need for phosphate fertilizers, especially on these neutral to alkaline soils where rock phosphate is not effective.

I inquire about the advisory service available to these farmers and am told that it is quite inadequate. A few advisory agriculturists work with local committees, but apparently mostly with the better farmers. The possibility exists that all the advisory work may be taken over by the central Department of Agriculture.

We drive up to the Eglinton Hotel in Galway about 10:30 p.m., very tired indeed. Here we are met by Mr. John Keene (Newcastle, Galway), the local agricultural officer. I refuse the usual amenities and go to bed.



B

E

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IRISH SEA

DUBLIN (BAILE ATHA CLIATH)

June 26 *is submitted to a big scheme for land improvement.*

We get up late (8:00 a.m.) in a cool, rainy morning, and have a leisurely breakfast with Mr. Mannion. After breakfast we go in a car with Mannion and Keene west along the north side of Galway Bay over undulating very stony soil from granite. The tiny fields are bordered by stone walls. Most of them are used as meadows and pastures. These are badly infested with bracken and weeds. I see lots of potato patches. The agriculture is mostly dairying. They also do some fishing. The principal transportation seems to be small two-wheel carts pulled by a single donkey. It rains very hard. *the glasshouse used for the*

Despite the stony soil, this area has a high population. Many of the younger people are said to be migrating to England for work. The Department of Agriculture gives help to the people here to keep their little holdings going, including fertilizers and lime. Since the Department helps them build stone houses, the old-style thatched houses are disappearing. The soil is said to be a very stony Podzol. Although broadly a plain, the surface is very irregular and bumpy. The rain comes down hard. *roof of the*

We pass Spiddal and continue west. Some of the homes have glasshouses for tomatoes, operated through a cooperative that raises the plants and handles packing and marketing under a scheme developed by the Department. They are sold mostly in Galway. The present Minister is said not to favor the extension of this scheme. He is

said to be committed to a big scheme for land improvement, principally through drainage and stone removal. In this Connemara district, a legendary figure, Finn McCool, could throw the huge boulders from one hill to another. Many now call this a "derelict" area.

I look at a disturbed old road cut in the heavy rain. The soil is a thin Podzol. The A_1 is somewhat thickened and very dark brown; the grayish A_2 is about 2 to 5 inches thick; the B_2 is 1 to 2 inches thick; and the B_3 varies from 5 to 9 inches in thickness and lies over stony till mostly from granite.

We stop to look at one of the glasshouses used for the tomatoes. The houses are unheated. In the original scheme, the houses were financed one-half by government grant and one-half by a loan payable out of the crop over a period of 10 years. The plants are grown in small hexagonal blocks, similar to those I saw used by the Russians in 1945. Instead of turf, the material is 7 parts manure, 3 parts "loam," and 2 parts peat. The main varieties are Scarlet Knight and Clibrin's Victory. The tomatoes are trained to a single branch. Enough water is collected on the roof of the house for irrigation within it. Spraying for disease control is done by the central service the Department has for the project. The soil is fumigated with formalin and sulphur. These expenses are paid out of the crop.

As we go on west, I am amazed at the number of farm families on such stony soil. Heavy dressings of sea sand are used in place of lime; and also seaweed is used for a few miles back from the coast. People make their own cloth from the wool of their own sheep. Besides, the women knit garments for sale.

We turn north near Cashla Bay in what is called the "worst" part of Connemara, toward Joyces Country. Rocks are mostly sandstone and granite. Peaty soil lies over very thin stony material. There are no trees nor tall shrubs. Over the rock is some thin granitic drift.

We stop to look at the soil on the upland, where I should call it a peaty Lithosol. The surface is essentially dark brown to nearly black, fine, partly decomposed acid peat with a cover of heather. This rests almost directly on the granite. Generally, the land is rolling with many little lakes and ponds. The surface is choppy and very stony. My guides tell me that well-developed humus Podzol is to be found in the area. Between the hills are some deep areas from which peat is often taken for fuel. A few such places are used also for potatoes, rye, and grass, especially after excavation of the peat and some improvement in drainage.

Here, in the rain, we pass a small camp of tinkers.

A bit further on I see some humus Podzol on the well-drained ridges. Along the road are little piles of cut peat carried up from the small bogs. I see a few sheep and some ducks.



K-1778 June 26, 1950
Ireland. West and north of Galway.
Characteristic peaty Lithosol on granite
in Connemara. (Rain)



K-1779 June 26, 1950
Ireland. West and north of Galway.
Characteristic rural scene in Connemara.
Peaty Lithosol and humus Podzol. (Rain)

Here a farmer has roughly 20 to 30 acres of enclosed land, partly tillable, besides rights in the commons and the right to cut peat from the bogs.

In some places, the peat is even thick on the uplands. With variations in drainage, this grades into the humus Podzol with a thick A₀ horizon.

The greater part of this Connemara country has few houses. These have been built on or near the small patches of fertile soil. Some of the families have been taken out of this area into the Midlands of County Meath, where land has been made available through subdivision.

We stop for a (too!) leisurely lunch in an old castle (Ballynahinch) near the center of the district. Afterward, we hurry back toward Galway through Joyces Country, over rolling stony land well covered with grasses and sedges. I see a lot of rather deep peat being cut for fuel and some humus Podzols on the steepest colluvial slopes. There are many lakes and small nearly flat areas of grass- and sedge-covered peat.

We turn north to Maam Cross and take the road north around Lake Corriba. Here the soil is developed from thin granitic till over granite. As we turn toward Cong, the soil is a bit better, but still very stony and with many peaty alluvial flats. Just a bit north of Cong, I find myself on Brown Forest soil from limestone with fairly nice meadows and small grains.

It still rains as we pass Cong and Headford. The small farms have fair meadows. The fields have stone walls around them but are not very stony within them. Sheep and cows graze in the fields, usually separately. Besides grass, there are fields of potatoes and oats.

We pass through a large flat area of peat, flooded in winter, that is to be drained in a big scheme. The dark brown, fairly well decomposed peat lies 24 to 30 inches over marl.

We stop in Galway for our luggage and leave again at 5:00 p.m. For Dublin, on the other side of the country!

We start out on undulating Brown Forest soil from limestone, with peat in the low places. Although there are many stone fences, most of the fields are stone-free. These are used largely for hay and oats. Most of the farmers are making hay here by the old methods, which are very bad because of the summer rains like the one today. They have some potatoes and roots. It is said that generally the soils in the meadows are quite deficient in phosphorus and potassium. I see quite a few beef cattle, although dairy cows predominate.

We pass Athenry. The sheep here look quite nice. They have medium wool. I see some sugarbeets on soil from limestone. The stands are poor because of an early drought.

We pass by Brown Forest soil on calcareous eskers, kames, and till. We come near the village of Esker, perhaps the origin



K-1780 June 26, 1950
Ireland. West of Cong. Peat cuttings
on hillside of thin till over granite.
(Rain)



K-1781 June 26, 1950
Ireland. East of Galway. Sugarbeet
weeder. (Note the felt leg guards.)

of the term used in glacial geology. For some distance the soil seems to be mainly Brown Forest soil from calcareous drift.

We pass Ballinasloe and stop for tea at Athlon at 7:20.

After tea, we continue toward Dublin. I examine a podzolic profile on an esker 2 miles east of Moate and collect a sample hurriedly. Although the rain has stopped, it is now beginning to get dark. (Sample taken.)

A ₁	0-4"	Dark reddish-brown loam; somewhat gravelly; medium crumb structure. (5YR 3/2) ^{1/} (pH - 7.1) ^{2/}
A ₂	4-14"	Heavy gravelly loam, with fine blocky structure; dark brown to very dark gray (7.5YR 4/0 - 3/2); hard when dry. (7.5YR 4/2) (pH - 7.5)
A ₃	14-18"	Brown (7.5YR 5/4 - 6/4) sandy clay loam; gravelly and gritty; angular blocky structure that is fairly easily friable. (10YR 4/3 - 5/4) (pH - 7.6)
A-B _{ca}	18-29"	Faintly mottled yellowish-brown (10YR 5/4) to strong brown (7.5YR 5/8), strongly mottled with nearly white. The material is almost massive, brittle when dry, heavy gravelly sandy loam. (Pale brown: 10YR 6/3) (pH - 7.9)
B ₂	29-38"	Dark reddish-brown sandy clay loam (approx. 2.5YR 3/4); some faint and fine mottling. Soil is fairly easily friable when moist and plastic when wet. (Dark grayish-brown: 10YR 4/2 - 7.5YR 4/2) (pH - 8.0)
C	38" +	Loose gray gravelly sand, with many dark-colored minerals. (10YR 5.5/1) (pH - 8.2)

^{1/} Color designations in parentheses at end of horizon descriptions refer to dry collected samples now in Beltsville.

^{2/} pH in laboratory at Plant Industry Station on collected samples.

P-III



K-1782 June 26, 1950
Ireland. Moate. Profile
of Podzol (?) on calcareous
esker. (Site of sample.)



K-1783 June 26, 1950
Ireland. Near Kilbeggan. Farm
courtyard.

The horizons vary widely in thickness; generally the solum is around 24 inches thick. These eskers are sharply rolling. Although originally forested, most of the land is in grass. This apparently "calcareous Podzol" is said to be a common profile. It is too bad that it is nearly dark. I gather that this soil is limited to calcareous parent materials in eskers and kames.

As we drive toward Dublin, we come onto an undulating plain of Brown Forest soil from calcareous glacial drift. High hedges border the road. Although there are fields of small grains and potatoes, the land is used mainly for grass grazed by dairy cows.

We pass Kilbeggan and go on toward Dublin for a very long and tiresome drive. We finally arrive at the Clarence Hotel at 11:20 p.m. Most too long a day.

June 27

I am up late at 8:00 a.m. and still very tired. We meet Dr. Thomas Walsh and at 10:30 a.m. go with him and Mr. Mannion north from Dublin to Ballyhaise through Kells.

We first pass over dark reddish-brown to reddish-gray Brown Forest soils some 2 to 3 feet deep over limestone. The B is friable, irregularly porous clay loam. This is said to be the best soil in Ireland for grass. Locally, these are called "gray-brown" soils to differentiate them from the redder ones further west. There is no evidence of podzolization. Dr. Walsh says that the soils are low in phosphorus and potassium and are high fixers of potassium. The silica-sesquioxide ratio of the clay is about 3.5 to 4.0. The soils have about 25 to 30 percent clay and a cation exchange capacity of around 18 - 20 milliequivalents per hundred grams. The very surface of the soil may be acid; for an inch or so the pH may be as low as 5.8. Even so, some of the soils respond a bit to lime. Dr. Walsh says that a pH of 5.8 reduces production more in these soils than a pH of 5.0 in those developed from noncalcareous materials. Production could be increased enormously here with applications of phosphorus and potash and with improved seeds. A great deal of this land is used for beef cattle, many of which are brought into the area from further west. In the low-lying areas, the soil is somewhat alkaline and manganese deficiency is a problem with oats. Dr. Walsh

says that farmers use little fertilizers, which is a great pity. The rainfall in this area is about 30 to 35 inches.

Just before Kells, we pass some stud farms.

Beyond Kells are soils developed from glaciated Silurian shales and grits. One sees many drumlins. The soil is brown and would probably fall in our Brown Podzolic group. The word "drumlin" was first coined in this area. This is not very good country. The soils are low in phosphorus and are phosphorus fixers. Many of the slopes are seepy. Pastures are weedy. We pass many large acid peat bogs.

I look hastily at some of the light brown soils from the shales. On them are a few good fields of potatoes, but the rows run up and down the slope. Even so, there has not been a great deal of erosion. It is a problem, however, to figure out how to drain these seepy slopes. I am afraid that terracing might worsen the already bad drainage. For good production, lime, phosphate, and potash are required, probably in rather large amounts.

From the road cuts I see that many of the soils have grayish-brown surfaces, with slightly massive, highly mottled gray and brown B_g horizons.

Frequently the potatoes are planted in little beds -- "lazy beds" -- on these soils.

We turn right at Stradone. The pastures are weedy on the seepy, acid soils. The best crops are potatoes and oats.



K-1784 June 27, 1950
Ireland. North of Kells. Drumlin with
light brown soil from Silurian shale
drift.



K-1785 June 27, 1950
Ireland. South of Stradone. Potatoes
in "lazy beds" on acid, imperfectly
drained soil from shale.

We arrive at the Ballyhaise Agricultural School about 1:00. Students study agriculture here for one year. They now have 27. To enter, students must have had all their primary education and some secondary schooling. There are a few field experiments, but no other research.

We have lunch with Mr. Kehoe, the Senior Housemaster; Mr. Harrington, who has charge of the field experiments; and others.

I go out over the farm and discuss with them the problem of improving these acid soils on the drumlins. The soils suggest those of the Mt. Pleasant Farm at Cornell, although this one here may be a bit heavier. The soils are sticky and acid and the clay is dispersed. They need lime and mineral fertilizers. It will be a problem to control erosion on the steeper slopes without worsening the drainage.

In the lowlands here the peat has a lot of mineral matter in it. It is dug out as a soft, gooey muck, carried in wheelbarrows, and laid out to dry in masses some 100 feet by 12 feet and 10 inches thick. These gooey masses are marked in small strips and later broken into bars when partly dry.

I am shown some factorial experiments with potatoes on the mineral soil, using lime, phosphorus, potassium, and nitrogen. The work seems to be good. I am also shown the making of grass silage in cheaply constructed pits.

P-V



K-2021 June 27, 1950
Ireland. Ballyhaise Agricultural School Farm. View of
drumlins, with peat in low foreground. In foreground
acid soils on shale.



K-1787 June 27, 1950
Ireland. Ballyhaise. Removing mucky,
silty peat.



K-1788 June 27, 1950
Ireland. Ballyhaise. Laying out mucky,
silty peat to dry.

P-VIII



K-1791 June 27, 1950
Ireland. Ballyhaise. Espaliered fruit
trees.

The school building itself is somewhat more than 150 years old and was the former manor house of a great landowner.

We return toward Dublin along the road to Kells, where we turn toward Beluin on undulating Brown Forest soil from calcareous drift. There are many large farms on this good soil devoted mainly to beef cattle and sheep. Also there are many fields of small grain.

We stop for tea with Sir Hugh Nugent at Ballinlough Castle (Clonmellon) at 6:00. This beautiful castle is said to be the oldest inhabited one in Ireland. It was built sometime before 1600, although rooms were added in 1740. Cromwell had his headquarters at the castle and was said to have kept his horse in what is the present hall. It was one of the very few not destroyed by Cromwell. The story is that he forgot to order its destruction and later sent a staff officer back to do it. The owner said, "OK, but you will have to fight it out with a pistol." The officer went back to Cromwell for instructions. Cromwell became incensed with his cowardness and didn't order the destruction. The furnishings inside are quite luxurious. I count 14 hats in the bathroom.

Although an Irish citizen, Sir Hugh is a former officer in the British Air Force. He gives me an old book on Irish agriculture printed in 1776.

We take a tour of a large and pleasant garden and discuss some of the problems of his fruit trees. He shows me some



K-1792 June 27, 1950
Ireland. Ballinlough Castle. A part
of the garden.



K-1793 June 27, 1950
Ireland. Ballinlough Castle. Pasture
seeded September 13, 1949. Brown Forest
soil.



K-1192 June 27, 1950
Ireland. Ballinacorney Castle. A part
of the garden.



K-1193 June 27, 1950
Ireland. Ballinacorney Castle. Pasture
seeded September 13, 1949. Brown Forest
soil.

pastures reseeded last September along with proper fertilization, and la Walsh.

Sir Hugh is a very engaging man, apparently settled down to make a good farm out of his ancestral estate, partly as a model that others might follow. The soil is good -- mainly Brown Forest soil from calcareous drift. Part of the soil is thin over low eskers. He already has two excellent pastures from fertilizing and reseeded, and plans to develop others. Walsh recommends fairly heavy dressings of phosphorus and potassium, with nitrogen the first year to give the grass a start. These pastures are used mainly for beef cattle. Nearly all of the estate is in grass except for small orchards and gardens.

He complains about the backwardness of Irish farmers, and especially about the dealers of feed and fertilizers. He says, for example, that one cannot buy the mineral supplements needed for pigs separately from the maize and other ingredients in the mixed feed (shades of the mixed fertilizer dealers in the USA!). I cannot see why it should be necessary for Ireland to import any maize. They could produce plenty of barley. Certainly the land here could produce 2 to 5 times as much if properly fertilized with minerals and with good legumes in the rotations. I urge trials with alfalfa for silage, pig pasture, and especially as a soil improver on the "tight" soils from shale.

We leave about 8:15 and return to our hotel in Dublin at 9:40 p.m.

Ballinlough Castle, On The Plains Of Westmeath



ONE of the smaller Irish castles, Ballinlough, home of Sir Hugh Nugent, Bart., stands on the broad plains of Westmeath, near the village of Clonmellon. Probably built in the 12th or 13th century, a wing with two towers, a drawingroom and dining-room were added about 1740. The present-day castle is a charming dwelling in which the best of olden days is combined with the most up-to-date ideas. It has been the home of a branch of the O'Reilly family for centuries and in 1812 (as related by Ita Hynes in her article on Page Two) Sir Hugh O'Reilly changed his name to Nugent.

(Pictures by "Sunday Independent" Photographer, Tony O'Malley).

Family Portraits

A FRONT view of Ballinlough Castle, which is one of the few old Irish castles not destroyed by Cromwell.



A CORNER of the Georgian drawingroom, a spacious room attributed to James Wyatt. Family portraits hang over the ornate white marble mantelpiece. To the right is a portrait of Count Andrew O'Reilly, one of the most colourful of the O'Reilly family and, to the left hangs a picture of Lady Louth, painted by Sir Joshua Reynolds.

★
A
Doorway
Designed
By Wyatt
★



THE Georgian Window on the landing of the stairway which leads up to the gallery from which the bedrooms open.



THE Georgian Corridor, in which hangs (on left) the Charter granted by George III to the first O'Reilly Baronet.

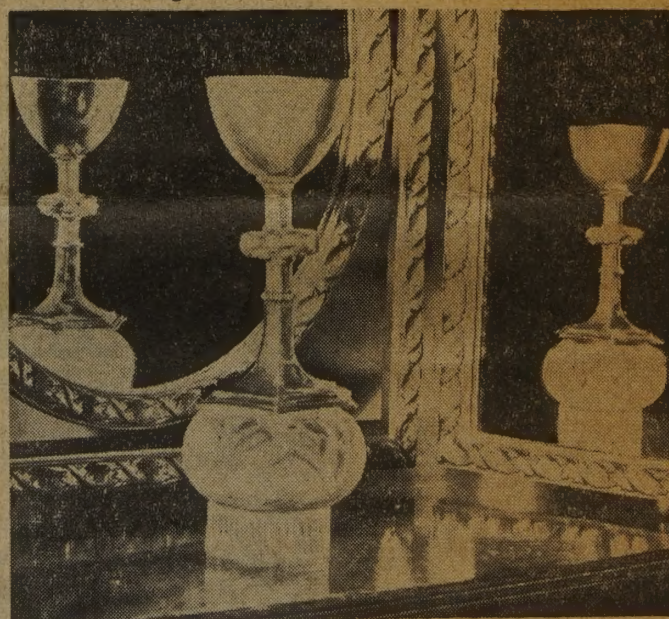


DOUBLE mahogany doors, set in an attractive Wyatt doorway, lead from the Diningroom to the Drawingroom.

Historic Chalice



THE Damask Room, reputed to be haunted by a golden-haired lady, who combs her hair and weeps. It is a lovely room, carpeted in almond green.



THE famous 15th century Ballinlough Chalice, once used in the Chapel which is now part of the demesne wall. The Chalice was saved when Cromwell destroyed the Chapel.

K-AND THEN THEY'RE OFF



ish M.R.C. Winter Motor Rally at Kilternan, yesterday, check from left: Mr. H. L. Stewart, Miss Sheila O'Cleary and Mr. R. E. Laird (Drumshanbo).

Garda Hurlers Comeback

Garda. 7-5; U.C.D. 5-1

THE well-known athletic personality, Garda Sergeant Ned Tobin, in charge of the sporting activities of the new Garda recruits, had the boys out at Belfield yesterday, where, in company with some of the older hands, they defeated U.C.D. in a senior hurling friendly by 7-5 to 5-1.

College, with the wind and with nine of their regular side, turned over with a lead of 5-1 to one point. After the interval Garda were strengthened by Recruit Terry Kelly at right half-forward and Tom Dowling at full-forward.

Kelly, a native of Tracton, Co. Cork, won Munster honour with his native county last year and was a sub on their All-Ireland side, while Dowling is a brother of the Cork full forward, Liam Dowling.

This pair made all the difference, notching between them four goals and one point of the scoring in the second half.

They were ably supported by Fitzpatrick, at full back, P. J. Walsh, right full, the Wexford county hurler, Mitchell, who was a commanding figure at centre half; and Greally and Ryan in the forwards. Best for College were Hurley, McGrath and English, backs, with Kennedy, Stokes Barrett, and Doyle also prominent.

Scorers for Garda were Dowling (5-0), Kelly (1-1), Power (1-1), Walsh (1-0), Sullivan (1-0), Ryan (0-1), O'Dea (0-1), Power (0-1). U.C.D. marksmen were Kennedy (3-1), Barrett (1-0), Sullivan (1-0).

SATURDAY HURLING LEAGUE
Kilshams 7-1; New Ireland 2-1.

TO-DAY'S DUBLIN FIXTURES
At Parnell Park-S.H.L.-St. Vincent's v. Eoghan Ruadh, 11.45 (G. Kelly). S.F.L.-St. Vincent's v. College of Pharmacy, 2.45 (B. O'Riordan).
At Iveagh Grounds-S.F.L.-Clanna Gael v. Guinness, 2.45 (M. Wellington).
At Is andridge-S.F.L.-Westerns v. Civil Service, 11.30 (J. Power).
At Pearse Park-S.F.L.-St. Agnes v. O'Toole, 2.45 (M. Leahy).
At Ballydown-S.F.L.-St. Mary's v. Army Metro, 2.45 (M. Hartnett). S.F.L. St. Joseph's v. Air Corps, 12.0 (M. Hartnett).
At Blanchardstown-S.F.L.-Garda v. St. Margaret's, 3.0 (M. McCoy).
At Swords-S.F.L.-St. Dymphna's v. Geraldines, 2.45 (J. McKettrick).
At Marvill-S.F.L.-Sean McDermott's v. Peadar Macken, 2.45 (J. Donegan). S.H.-Friendly-Fauna v. Crokes, 11.30.
At Watermill Lane-S.F.L.-Kilshams v. Parnells, 2.45 (R. Wilkinson).
At Belfield-S.F.L.-U.C.D. v. Round Towers, 2.45 (L. Greany). S.H.-Friendly-U.C.D. v. New Ireland, 11.30.

A Rule By Any Name....



CAN YOU SPOT IT? By A

CAN you spot the rule that suggests names, yet defies the apt description the "Advantage," the "Parish" or the "Rules"? Officialdom points it out by n football and 148 for hurling and heads Play." I venture to suggest, however, have their own names, for this rule is th cult of all to "keep" in the stress and str hurling and football.

Primarily this rule deals with the ball and might in consequence be named after the leather. It lays down how the ball may be caught, kicked or carried; it prohibits throwing and hopping more than once. Then again it might be termed the "Evolution" rule, since it has marked the development of football down the years.

Take the hand pass for instance, trace its introduction, development and fall through the history of the rule. Hand passing is now out and the fisted pass takes its place, but the way is open for further development. We may yet see a player transfer the ball to another by hopping it in such a way that his colleague can catch on the rebound.

Spectators will find fault with this rule, but the majority would surely expect to hear the whistle every time a player in possession "turned" twice. Would they be correct?

There is nothing in this rule or in any other about turns! A player may turn as often as he can provided he does not take more than three steps or hold the ball longer than is necessary to hop kick or fist it away. I have often wondered just how long this should be. Take the case of a player in possession who is cornered. What should he do? Is the turns act just a referee's easy way out?

Though this rule has changed more often than any other, further adjustment is not to be expected. One aspect, however, strikes me as peculiar and officials and players with whom I discussed it, found the same peculiarity which is: that a player in possession is allowed only three steps. Formerly it was four and doubt surrounds the legality of the change and the necessity for it.

"How?" asked a Senior referee and prominent player of the four-step era, "can a footballer travelling at 100 yards pace, catch the ball in the air, alight, adjust himself and kick, all in three steps. If he is on the wrong foot landing he will be the same after three steps." It can be done, however - remember "McArdle" of Louth in the All-Ireland semi-final against Kerry.

Those who hold that the playing rules and, consequently, fouls are far too numerous, would welcome a return to four steps. The concession might mean less whistle and in football this would be a blessing.

What avid rule reader has not been told at some stage or other that players themselves know more about the rules than any "hurler on the ditch"? Having dallied at hurling and football with but slight success and less recognition, I have often felt the weight of this sarcasm. Nevertheless, I do not agree with the statement. Only the star players know the rules inside out, consequently "148 and 148" could be called the "Experts' Rule! Its observance marks out the top-notchers every time.

I have seldom seen Ring, Flood or Largin (who is notorious for overplaying the ball) whistled for a breach of this rule.

In football, McEvoy, Heffernan, Carney or Kerrymen generally-

rarely break it, but all these are the experts. For the "general practitioner" the rule is a bugbear, it can be broken so often and so easily.

If you can "spot this rule" in operation you have a sure guide to the standard of the game you are watching.

Next article - Spot the rule which allows a player resident in one county to play in another.

Answers to Queries

Arising out of "Spot the Rule," I have had many queries. Here are some of the answers:-

Changes in Playing Rules can be made only at Congress every

General Gossip

New hurling clubs have been started at Carrick-on-Suir and Goresbridge (Co. Kilkenny). The Dublin Garda team enjoys a new lease of life following the advent of such notables as Mitchell (Wexford) and "Ted" Kelly of Cork.

"That playing time be extended tended to 80 minutes" is one of the 40 odd motions before the County Down Convention at Newry to-day.

M. Fogarty, Knockshewanna and Tipperary Junior goalkeeper, has arrived in New York, and P. Grimes, the Waterford half-back who spent a season at home, has returned to America.

Crokes' midfielder, J. Dwane, is hurling so well just now that I expect he will get a place on the Dublin Junior team, probably as a half-forward.

CAMOGUIDHEACHT

Camogie fixtures for to-day:- Intermediate-U.C.D. v. N. Aolia, 11.30; Miss Ennis, Sen.-Celtic v. A. Stacks, 12.30; Miss Scullion, Inter.-C. Service v. M. O'Neill, 2.0; Miss McGowan, Sen.-Col. San Dominic v. C.I.E., 3.0; Miss Foy, Junior-"A"-A. Stacks v. St. Agnes, 11.0; Miss Ward, E. Ruadh v. Jacobs, 12.0; Miss O'Reilly, "B"-M. Assumpta v. C.I.E., 1.0; Miss Lennon, "A"-St. Enda's v. R. Towers, 2.0; Miss O'Hart, Peamount v. St. Mary's (S.), 3.0; Miss Coleman.

A* Coolock-Celtic v. Dominick St. P.P., 3.0.

GOLF CARDS AND NOTICES

CASTLE-Scotch foursomes-1st 9-J. G. Barnwell and J. A. Ray (61), 331; P. A. O. Blochain and J. Farrell (43), 341. 2nd 9-B. Kelly and T. Scully (10), 33; J. D. Bradley and L. Dessy (9), 341.

CLONTARF-To-day-Fourball, 12 holes. **DELGANY**-Fowl-F. M. Byrne (6), 36; Class 2-R. Singleton (20), 31. To-day-Fowl, 2 classes.

DUN LAOGHAIRE-Medal-J. Ward (8), 1 up; Class 2-J. J. Hayes (15), 2 down. Class 3-O. H. Barton (18), 1 down. Sat.-Social evening.

EDMONDSTOWN-January 31-Monthly stroke competition.

GRANGE-Medal-O. Carty (12), 35; A. E. O'Connor (8), 38; O. O'Farrell (12), 36. Class 2-T. Bourke (18), 35; P. J. Muldowney (16), 36. Friday-Information dance, 9-2 a.m. Sat.-Fourball, 9 holes.

GREYSTONES-Sat.-Scotch foursomes, 9 holes, stableford.

HOWTH-Scotch foursomes-D. Quinn and S. O'Brien, 824; J. S. Conway and G. Heywood, 65. To-day-Scotch foursomes.

KILLINEY-Entries for Scotch foursomes (G. Ellis's prize) close to-day.

LUCAN-Club Prize-T. McCarthy (16), 1 up. To-day-Club Prize (Stableford), two or more cards.

MILLTOWN-Fourball-2nd 9, P. Mulcahy (4) and S. Monahan (16), 3 up; H. H. Symmons (9) and J. McGloughlin (10), 1 up; J. K. Donnelly (8) and S. M. O'Connell (16), 1 up. Sat.-Scotch foursomes.

NEWLANDS-To-day-Fourball, 9 holes.

RATHFARNHAM-Fourball-1 up; W. G. Bailey (9) and F. Bullagh (20), 1 up; L. Meagher (10) and C. Chamney (11), 1 up. Sat.-Fourball.

ROYAL DUBLIN-Singles-D. P. Herlihy (3), all square, on last 3; J. P. Malley (8), all square; C. Hart (8), all square. Sat.-Singles, 14 holes.

SKERRIES-Silver Spoon postponed until Saturday.

ST ANNE'S-Scotch foursomes-R. Rowlette and L. McCarthy, 621. Next Sunday-Fourball.

SUTTON-Fourball-A. P. Mallery (9) and R. J. Campbell (10), 5 up; J. Larkin (4) and J. J. Fitzsimons (11), 4 up; D. Egan (12) and B. N. McClancy (13), 4 up. Sat.-Scotch foursomes.

WOODBROOK-To-day-Scotch foursomes, 12 holes. Wednesday-Fourball, 9 holes.

Ladies
CLONTARF-Sweep, Mrs. R. Magill (11), 40; class 2, Mrs. J. Stewart (18), 37. To-morrow-Sweep (9h.), Thursday-Medal; arrange.

DUN LAOGHAIRE-January Medal-Mrs. O'Keefe qualifies, Thursday-Annual general meeting, 7.30.

GRANGE-Tuesday-January medal.

KILLINEY-Mrs. Towers (9), 44; Mrs. Mulcahy (11), 43. Sealed Holes-Miss Ashlin. Committee-Captain, Mrs. Norman, Mrs. Saunders, Miss E. Dalton, Miss O'Grady, Mrs. Ellis, Mrs. Ross Todd, hon. sec. Friday-Sweep-Committee meeting, 4 o'clock.

RATHFARNHAM-Medal-Mrs. Robertson (9), 1 down. Class 2-Miss McCormick (31), 3 down. Tuesday-Stroke.

SUTTON-Sweep-Mrs. Mahon, 3 down; Mrs. Thomas, 4 down. Tues.-Sweep (9 h.), Draws 10.30 and 2.15.

WOODBROOK-Tuesday-Postponed medal (two classes). Arrange.

"G.A.A. Pitches Exploited" Accusation

THAT a number of sites for G.A.A. pitches, obtained by Galway County Board from the Irish Land Commission were being exploited by some of the trustees who now seemed to think that the G.A.A. had no longer control of them, was stated by the Very Rev. J. O'Dea, P.P., President, at the Co. Board in Galway.

He suggested that the District Boards should take up the matter with the Minister for Lands with a view to having ejected from office, trustees who were not carrying out their duties according to agreement.

Mr. Stephen Jordan, Hon. Secretary of the Kenny Memorial Park Committee, Athenry, told the meeting that the park would be completed this year and handed over to the G.A.A. The park, which would be one of the best in the country, would not cost the G.A.A. one penny.

It was announced at the meeting that the Central Council had decided to award twenty shields to the Galway Co. Hurling Team who were runners-up in the All-Ireland Hurling Final last year.

Very Rev. J. O'Dea, President, told the meeting that the C.I.E. Lost Property Office had forwarded to him a 1952 all-Ireland minor football medal.

Galway won the title in 1952.

To-day's Handball

WITH practically all the best handballers in the country in action to-day in the venue finals of the Gael Linn Cup competition, there should be plenty of action at various centres.

This should be particularly noticeable at Crumlin where there are two excellent pairings Larry Roe and Mick Fahy, both from the St. Michan's club, and Des. Dillon and John Doran.

"Those who drink water think water" (Charles Kingsley)

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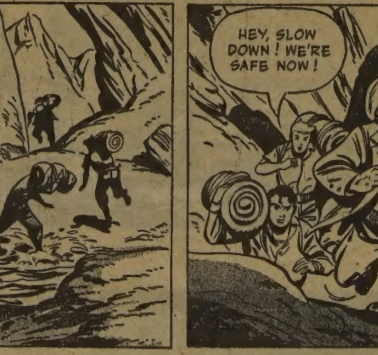
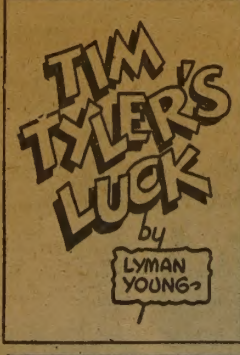
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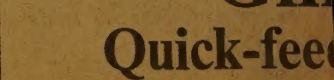
Mr. T. J. Harie, Sligo, holding the first salmon of the 1954 season taken on rod and line on Lough Gill, Co. Sligo. With him is Mr. M. Costello. The salmon weighs 11 lbs.



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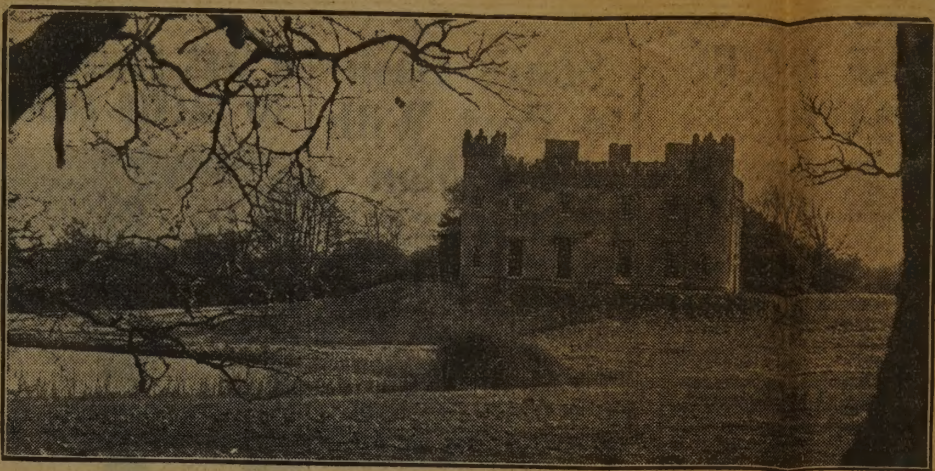
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Ballinlough Castle: Ancestral Home of the O'Reillys Family's Founder Was Baptised by St. Patrick



Ballinlough Castle in a winter setting

THIS is the eleventh article in the on historic Irish written by ITA HYNES

BALLINLOUGH CASTLE is the home of Sir Hugh Nugent, Bart., stands in the village of Clonmellon, Co. Westmeath, one of the smaller castles and is, therefore, relatively easy to run as a household. Ballinlough Castle is also one of the loveliest of our castles. The interior has been redecorated in the most exquisite taste by the present owner and his wife.

It is not certain when Ballinlough Castle was first built, but it is estimated that its history goes back to the 12th or 13th century. The history of the family goes back much further than that.

An O'Reilly crest, dated 1618, decorates the wall above the main hall-door of the Castle. In 1740 the new wing, with two towers, a drawing-room and diningroom, was added.

In 1812, Sir Hugh O'Reilly changed the family name to Nugent when his wife inherited the property of her uncle, John Nugent, who had been Governor of Tortola. So the family name at Ballinlough is now Nugent. In the morning-room, the O'Reilly crest adorns one side of the fireplace, while the newer Nugent crest is on the other side.

CLAN NAMES

THE O'Reillys of Ballinlough can trace their ancestry back to Duachas Galach, son of Brian, the fourth Milesian King of Connacht. Duachas Galach was baptised by St. Patrick in 435 A.D., and to this day the family is a Catholic one.

The O'Rourke clan of Breffni springs from the same root, Maolmordha, and the O'Reilly territory in the days of Brian Boru was named East Breffni while the O'Rourkes held West Breffni. Raghallagh O'Reilly, who gave his name to the clan, was commander-in-chief of the army of King Malachi II until this king was deposed in 1002 by Brian Boru.

When Brian Boru became High King, Reilly joined his forces and fought with him against the Danes. Fighting at the head of his clan, Reilly fell in the Battle of Clontarf, on Good Friday of 1014.

In the third year of his reign, Brian Boru commanded

that all the Clans of Ireland should adopt a distinctive family name.

Each Clan took the name of one of its famous ancestors who was noted for valour, wisdom or piety. They added, as a prefix to the name either O, to denote a descendant of the illustrious Chief, or Mac, denoting the son of the man whose name was chosen. Thus Muintir Maolmordha became O'Reillys.

FAMOUS O'REILLYS

A FAMOUS O'Reilly was Giolla Iosa Ruadh O'Reilly, who became chief of the O'Reilly Clan in 1293. He was a great warrior and he extended the dominions of the O'Reillys from Drogheda, in Co. Louth, to Rathfriland, in Co. Roscommon. In 1300, he built and endowed the Monastery of Cavan in which he erected a magnificent Chapel and a mausoleum of marble for the O'Reillys. This was afterwards destroyed by English soldiers, and the stone and marble used to build a horse barrack.

In his old age, Giolla Iosa returned to the Monastery of Cavan, and his brother, Matha O'Reilly, became chieftain of Muintir Maolmordha.

Some hundreds of years later, the O'Reillys of Ballinlough, after the Battle of the Boyne, were enriched by twenty thousand pounds. Hugh O'Reilly married the daughter and only child of Sir Daniel O'Neill, who with his brother, Neill O'Neill, fought in King James's Army at the Battle of the Boyne.

Neill was killed in the battle and Sir Daniel went to France with King James after his defeat. Later, he was pardoned by King William and invited to return and resume possession of his estates in Ireland. On his return journey he died at Calais, and King William, on hearing of his death, bestowed the sum of £20,000 on his daughter as a dowry on her marriage with Hugh O'Reilly, of Ballinlough.

Their son, James, married Barbara Nugent. Two of James O'Reilly's sons entered into the military service of the Emperor of Austria—Andrew, who was later created a Count of the Holy Roman Empire, and John.

Margaret O'Reilly, a daughter of James, married Richard Talbot, of Malahide Castle, and became famous as Baroness Talbot de Malahide. She was created a Baroness in her own right in 1831.

COUNT ANDREW

COUNT ANDREW O'REILLY, whose portrait hangs in Ballinlough Castle, was one of the most colourful figures of the O'Reilly clan. He was born at Ballinlough in 1742 when the Penal Laws were in full force. As a young man of eighteen he entered the Austrian service and fought in the Seven Years' War. After his valiant service against the Turks he was promoted to the rank of Major.

Later, when tales of his bravery reached the ears of the Emperor, he was appointed Colonel in command of the Emperor's own regiment. Other honours followed, and Andrew O'Reilly became private aide-de-camp to the Emperor, then Chamberlain, and later Count of the Holy Roman Empire.

When the Emperor Joseph II lay on his death-bed he called Count Andrew to his side and presented him with a gold snuff box containing his portrait set in diamonds.

After the Emperor's death Count Andrew O'Reilly remained in the service of Austria, and as a reward for his valour at the battle of Marciennes, fought against Revolutionary France in 1793, he was made a General. Count Andrew led the Austrian armies against the French at Ulm, and in 1796 he fought Napoleon's army in Italy. During the Austrian retreat of 1797 he commanded the rearguard, and at Baden he was taken prisoner by the French after being wounded. His skill and reputation as a soldier may be judged by the fact that on this occasion the French exchanged him for their Marshal Ney, who was in Austrian hands.

Count Andrew O'Reilly

fought at Marengo and at Austerlitz, and when Napoleon stood at the gates of Vienna in 1809 the city was defended by its governor, who was none other than Count Andrew. By this time our Irish hero had attained the rank of Field-Marshal and Knight Commander of the Military Order of Maria-Theresa.

Count Andrew O'Reilly died in Austria in 1832 when he was in his ninetieth year.

CHANGE OF NAME

IT was Count Andrew O'Reilly's eldest brother, Hugh, who took the name of Nugent. In July, 1795, Hugh O'Reilly, whose mother was a Nugent, was created a Baronet. John Nugent, who became Governor of Tortola, succeeded his brother, Lavallin, who died unmarried. Anthony Nugent, a younger brother, died during Lavallin's lifetime, and Patrick, the remaining brother, had died young. Therefore, when Governor John Nugent died unmarried in 1812, his property devolved on Sir Hugh O'Reilly (whose son and heir, James, was married to Governor John's sister) and on two other relatives.

All three assumed the name of Nugent, and so the first Baronet of Ballinlough Castle became Sir Hugh Nugent.

Sir Hugh Nugent was succeeded by his son, James, who died without issue in 1843, and was succeeded by his brother, Sir John. Sir John Nugent, like his famous ancestor, Count Andrew, entered the Austrian service, and became Major of Hungarian Hussars and Chamberlain to the Emperor Franz Josef. When he was forty-two years old he married Letitia Roche, of Ballygran, Co. Limerick, and settled down at Ballinlough Castle. His son, Hugh, succeeded him as 4th Baronet. He was accidentally shot, and his brother, Sir Charles, came into the title. He died in 1929, and was succeeded by the present holder of the title, his

grandson, Sir Hugh Nugent. Sir Hugh's father was killed while riding in a steeplechase at Ostend.

THE CASTLE TO-DAY

TODAY, Ballinlough Castle is a charming dwelling in which the best of olden days is combined with the most up-to-date ideas of the 20th century. Sir Hugh and Lady Nugent live there with their sons, John, who is nineteen and a 2nd Lieutenant in the Irish Guards, and David, who is seventeen.

Horses are the predominant interest of the Nugent family these days. The entire family hunts with the Ballymacad Foxhounds, and for the past few years the Ballymacad Hunt Ball has taken place at Ballinlough. In his spacious office, which occupies a large part of the basement of the Castle, Sir Hugh Nugent looks after the affairs of his estate and stud farm.

On the walls are photographs of the famous stallion, His Slipper, which is owned by Sir Hugh's mother, Mrs. E. J. King, the well-known racehorse owner.

In the safe in Sir Hugh's office is the 15th century chalice which was once used in the chapel at Ballinlough.

Made of solid gold, the cup of the Chalice is plain, and stands on a hexagonal base. Connecting the cup and the base is a slender stem in the centre of which is a ring ornamented with crosses and leaves. On one side of the base, a Crucifix is faintly etched.

CROMWELL

THE Ballinlough Chapel stood in the demesne at the roadside. When Oliver Cromwell sacked the Castle, he destroyed the Chapel, and to-day all that remains is a gable-end of the building surmounted by a cross, and the Holy Water font. When Cromwell plundered the Chapel, the priest snatched the Chalice and ran across the park towards the Castle.

In his haste he tripped, and one side of the Chalice was dented by its contact with the ground. The ding is still to be seen in the cup of the Chalice.

A large hall-door of oak, locked with a huge brass lock, leads from the sweeping drive into a square Hall. In the centre of the Hall hangs a brass lantern which has been in the Castle since the 17th Century. In front of the hall-door, a wide and graceful staircase

leads to a balcony from which the bedrooms open. A door to the left leads through the small Library to the new wing. In the Library, sporting prints decorate the wall-space between the bookshelves. One print shows the finish of the Grand National of 1901, which was run in a snowstorm. Challenging the winner is a horse named Drumcree, ridden by Mr. Hugh Nugent, father of the present Sir Hugh.

A deep recess beside the fireplace in the Library was formerly a priests' hiding-place.

LARGEST WINDOWS

FROM the Library, we pass through a passage, where Cromwell is supposed to have tethered his horse, into the elegant Georgian Drawingroom. This spacious room is attributed to James Wyatt, who left his mark on so many Irish castles and who built Castle Coole, in 1790, for Lord Belmore.

A crystal chandelier hangs in the centre of the room and is reflected in the large mirror which fills the wall-space between two enormous windows—they are reputed to be the largest windows found in any Irish house. The ornate marble mantelpiece is a replica of that in Curraghmore, the home of the Marquess of Waterford. The iron fire-back shows the Coming of the Three Wise Men.

Family portraits hang on either side of the fireplace, among them a painting of Count Andrew O'Reilly, and Sir Joshua Reynolds's painting of Lady Louth. In the circular tower-room, which leads off the drawingroom, hangs a painting of Ballinlough Castle by Eliza O'Reilly.

Passing through big doors set in an ornate James Wyatt doorway we come to the Dining Room, which is also part of the new wing. A big brass lamp which hangs in the centre of the room catches the eye. It is a genuine Adams lamp designed for burning colza oil. Sir Hugh Nugent picked it up at an auction a few years ago.

Pictures in the Dining Room include a painting of Lady Thurles which was exhibited at the Great Industrial Exhibition of Ireland in 1853. A portrait of Sir John Nugent, Chamberlain to the Emperor Franz Josef of Austria and great grandfather of Sir Hugh, hangs above the fireplace. As in the Drawing-Room the 16th Century fire-back is ornamented with a Biblical theme—the Marriage Feast of Cana.

HAUNTED ROOM

RETURNING to the Hall we mount the stairway leading to the gallery and bedrooms. The Damask Room is the only haunted room in the Castle. In this lovely room, furnished with an almond green carpet and a four-poster bed, a beautiful golden-haired girl combs her hair and weeps before the dressing-table mirror. Lady Thurles has also been seen standing in the Gallery doorway. At the other side of the Balcony, a short flight of stairs leads to a narrow Georgian passage where the Charter granted by George III to the first O'Reilly baronet hangs on the wall.

A small, cosy Morning Room which leads off the Hall to the right is furnished with some book-cases, a writing-desk, and some comfortable armchairs. Family photographs stand on an occasional table. A set of Hamilton miniatures hangs in the two alcoves.

Nowadays Sir Hugh spends most of his time at Ballinlough Castle running his own stud and that of his mother, Mrs. E. J. King. He enjoys a good day's racing and is seen at all the important meetings. In winter time he likes to get away for a few weeks of winter sports in Switzerland or in Austria where so many of his clan became famous.

Pictures on Back Page.

Next—Florence Court, Enniskillen.



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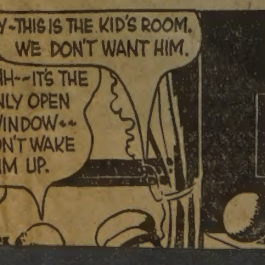
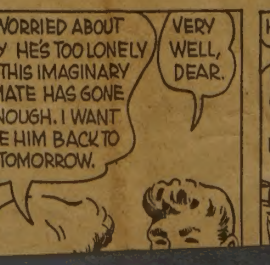
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FROM VILLAGE OF DISASTER COME RESCUE WORKERS WITH A VICTIM SAVED



WRAPPED on a sledge, a victim of the avalanches in the disaster-stricken village and area of Blons, Austria, is brought by rescue workers to a casualty station. In the background is an Alpine Crucifixion shrine and, beside the shrine, a bus stop.

Mother Died Trying to Save Daughters

RUSHING from her home with her husband on hearing one of their daughters screaming outside, Mrs. Mary McGarrity, 49-year-old mother of 12 children, met her death in a tragic aftermath to Friday's gale, it was stated at an inquest in Enniskillen yesterday.

Mrs. McGarrity, wife of John McGarrity, of Townhill, Irvinestown, was electrocuted as she and Mr. McGarrity tried to aid two of their daughters who had become entangled in an electric cable which had been blown down by the gale.

The family live in apartments in the Old Workhouse in Irvinestown, and the tragedy occurred in the yard in which the building is situated.

The two daughters, Josie (24) and Veronica (19) wept as they told Mr. George Warren, coroner, and a jury what had happened as they were returning from the cinema at 11 o'clock on Friday night.

"Felt Paralysed"

"I was walking home with my sister, Josie, and we were linking each other," said Veronica. "Just after we went through the gateway near our house I suddenly heard Josie say, 'Veronica, watch yourself.' Before she had finished saying this I was thrown to the ground on my back. I felt paralysed, but was conscious."

"I heard Josie scream, 'Mammy, come and help us. We are caught in the wire.'"

"I heard voices shouting around us and the next thing I found I was lying on the gravel path released from the wire."

Josie, the other sister, said she could not remember distinctly what happened after they entered the yard. She remembered saying something to Veronica, and then screaming and calling for her mother. She identified the body as that of her mother.



Mrs. Mary McGarrity

QUEEN ELIZABETH'S PRESIDENT COTY
TWO AIR TRIPS TAKES OVER

Ship's Dash to Port With Sick Man

THE Fleetwood trawler, Julia Brierley, was making for Moville, Co. Donegal, with all possible speed last night with 50-year-old Second Engineer Martin Higgins, of Stanley Ave., Poulton-Le-Fylde (Lancs.), seriously ill with a perforated ulcer.

The skipper established contact by two-way radio telephone with Oban (Scotland) Hospital, who instructed him to make for the nearest port at full speed.

The Captain was instructed to give the sick man morphia, and no food.

The last report from the trawler indicated that the officer's condition was deteriorating.

The vessel was expected at Moville to-day.

BOY CARRIES ANOTHER ON HIS BACK AS BOAT SINKS

DAVID KEMP (17), cox of a Hammersmith (London) school eight made heroic efforts to save his stroke, M. S. Smith, of Ealing, when their craft filled and sank in the choppy waters of the Thames, near Hammersmith Bridge, yesterday.

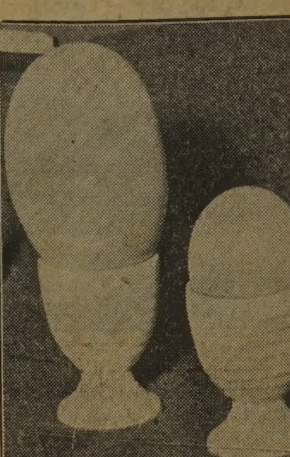
Kemp, with Smith, a non-swimmer, on his back, had nearly reached safety when Smith disappeared.

The other seven boys and Kemp, all aged about 17, were saved. One was taken to hospital.

The crew had been for a practice run and the tragedy happened when the outing was nearly over.

The boat was about 12 yards from the landing stage when it sank.

IT WAS SOMETHING TO CACKLE ABOUT



Is this a record? The outsize egg seen here was laid last week by a two-and-a-half-year-old black hen owned by Mrs. Hugh Wilson, Jun., Scrogg Road, Kilkeel, Co. Down. When the egg was broken it was found to contain a yolk and white in one end, and in the other end a complete egg of normal size. It weighed 6½ ozs.

Another Egg Crisis!

Mrs. M. Dunworth, Laccacoom, a well-known poultry producer, has a freak egg—two eggs in one.

The outer egg has no shell, being covered with a thick skin. The interior is of a jelly-like substance, which provides a covering for a fully-developed egg of normal size.

Mrs. Dunworth regards the freak as a show piece.

"In all my life," she said, "I have never seen anything like it."

No Structural Weaknesses in Comets Sabotage "Cannot Be Overlooked"

BRITISH OVERSEAS AIRWAYS CORPORATION announced in London last night there is no evidence of structural weakness in its Comet aircraft, one of which crashed into the Mediterranean last Sunday with the loss of 35 lives. The statement, authorised by Sir Miles Thomas, B.O.A.C. chairman, added:—

"The possibility of sabotage cannot be overlooked and special security investigation officers are being sent to points along the route to the Far East."

"The whole operational fleet is now at London Airport and the last aircraft to come in, that from Tokyo, will be stripped for examination as soon as the others are completed."

RESTART TO-MORROW

"The Corporation is restarting normal crew training and familiarisation flights as from Monday, January 18. No passengers will be carried until the last of the Comets in the fleet has been fully inspected."

Sir Harold Whittingham, B.O.A.C. Director of Medical Services, and Group Captain W. K. Stewart, R.A.F. Medical Establishment, Farnborough, left for Rome last night to continue the medical investigation "which, in the absence of reclaimed remains of the aircraft, constitutes the most effective line of investigation."

"Makers of underwater television are preparing a set intended to be capable of use up to a depth of 600 feet."

"Its effectiveness must naturally depend on the state of the sea floor in the Mediterranean off Elba and on the clarity of the water."

At the request of B.O.A.C.

Bomber Crashes,

A U.S. B-29 bomber crashed in the Libyan Desert 40 miles south-west of Tripoli, killing three members of the crew and injuring the other eight.

Bank Official's Transfer

Mr. F. O'Brien, of the Bank of Ireland, Waterford, has been transferred to head office in Dublin. He is a brother of Mr. Des. O'Brien, former Irish Rugby captain.

Small Burn

On the angle of the left shoulder blade there was a small linear burn about one and a half inches long which appeared to have been caused by the wire.

Death was caused by paralysis of the respiratory centre caused by receiving an electric shock through the body.

A verdict was returned accordingly, and sympathy was expressed with the husband and the 12 children.

**Quake On Continent
Ice Floes In Streets:**

WHILE Ireland settled down yesterday to the comparative calm of a high wind, icy gales added new terror to Europe's week of disaster.

From the Continent last night came reports of

More people killed.

Flood warnings in Germany, Holland and Denmark.

Ice floes in the streets of Hamburg.

An earthquake in Austria's avalanche-stricken area.

Heaviest snowfall in 13 years.

Towns raided by starving wolves.

The freezing gale halted the avalanche peril—but brought fresh disaster, at least seven people were killed in 80 m.p.h. gales over Germany when bomb-

South Jutland coast, and dyke watchers with "walkie-talkie" radio sets patrolled Holland's sea defences.

Many North German coastal areas are already flooded, particularly in the island of Sylt. Ice floes floated down several Hamburg streets yesterday. Cuxhaven's harbour area was under water.

Wolves raided towns and villages in northern Greece in search of food. A policeman in Macedonia fired at three which invaded the town.

Yugoslav motorists hoping to reach Athens for the Monte Carlo rally were halted by snow-drifts and only eight of 40 broke through the mountain barrier into Greece.

Budapest Radio reported the heaviest snowfall in Hungary for 13 years. Army trucks were being used to supply Budapest with bread and other essentials.

**NORTHERN
MINISTERS
STAND
CONDEMNED**

See Page Six

Tullamore Company's Big Profit

A BIG change in their trading is recorded by the Tullamore-situated company, Salts (Ireland) Ltd, for they report a net profit of £187,072, after deduction of all expenses, including taxation, for the year ended September 30 last. For the previous twelve months they had had a loss.

The directors transfer £50,000 to general reserve, £100,000 to reserve for depreciation of stock, £1,000 to employees' pensions, and recommend the following dividends:—

1—On the 5 p.c. Cumulative Participating Preference shares: (a) 2½ p.c. for the half-year ended Dec. 31, 1953, less income tax, £1,953; (b) an additional non-Cumulative Participating dividend of 2½ p.c. in respect of the year ended Sept. 30, 1953, less income tax, £1,953.

2—On the "A" 5 p.c. Cumulative Preference shares: 2½ p.c. for the half-year ended Dec. 31, 1953, less income tax, £2,734.

3—On the "A" and "B" Ordinary shares: 10 p.c. for the year ended Sept. 30, 1953, less income tax, £7,813.

The profit for the year has been quite exceptional. At the last annual general meeting the chairman explained that arrangements had been made with the Department of Industry and Commerce to recoup the loss incurred as a result of stockpiling of wool at the request of the Government.

The company has benefited from these arrangements and their effect has been reflected in the profit.

These arrangements have now terminated and future results will be directly related to the operation of normal trading.

Cavendish

SALE

LOWER Than ever

UNCHALLENGEABLE VALUES — UNREPEATABLE BARGAINS

Sensational!
THREE PIECE SUITES
ONLY A FEW
Tapestry of lasting quality!
£29/1/6
IMMEDIATE DELIVERY
only 5' weekly

PIANOS
FAMOUS MAKES
£1 SECURE DELIVERY
FROM ONLY
12'6 weekly

Unrepeatable!
BEDROOM SUITES
IN FIGURED OAK
Sale £31.19.6
IMMEDIATE DELIVERY
only 5' weekly

RUGS
CARPETS
SENSATIONAL SALE PRICES
from 26 weekly

GREAT Money Saving BARGAINS

Save £££s
DINING SUITES
FEW ONLY IN OAK
£30.19.6
IMMEDIATE DELIVERY
only 5'3 weekly

COMFORTABLE
BED SETTEE
from 28½ Gas
Tapestry with wood frame
5' WEEKLY

Assorted
BEDDING BALES
COMPRISING BLANKETS
SHEETS PILLOWCASES
TOWELS QUILTS SPREADS
from **4'6 Wkly.**

INLAID LINO
FOR AVERAGE ROOM
1'6 WEEKLY
REMNANTS
HALF-PRICE

June 28

We are up, packed, and ready for Dr. Walsh at 9:30. First we call at the American Embassy, then drive around Dublin, along some of the streets where Blum and Stephen walked in Ulysses. I see Joyce's old home and where he went to school.

About 11:00 I have a most interesting conference with Mr. Dillon, Minister of Agriculture. He explains rather enthusiastically their program of reclamation -- for drainage and stone removal. I tell him frankly that this program doesn't greatly impress me at the present time. Ireland has lots of good soil and I question the feasibility of large investments in this poor land that would also require heavy fertilization and liming for success. Even if they double or triple the yields on the poor soil, they still wouldn't be very good. I explain why it seems to me that the best opportunity is in the good land, like the Brown Forest soil from calcareous drift. With only fertilizer and reseedling, production could easily be doubled or tripled. I feel that an investment in subsidized fertilization would pay off more and much more quickly. The Minister argues against this: "A farmer and his boy can't move a three-ton boulder with their bare hands. For that, they must have a machine that only the Government can furnish. I am convinced that when Irish farmers see the results of Dr. Walsh's

P-X



K-1794 June 28, 1950
Ireland. Dublin. James Joyce lived in
one of the houses on the left.

research, they will use the fertilizers. It will be up to us to see that they can get fertilizer at fair prices."

I reply that I see his point, as an academic one; but insist that if he wants to improve production in the next 4 or 5 years rather than waiting 20 or 25 years, that the Government will get much more from an investment in subsidized fertilizer, with the thought that farmers will see these results on their own farms now.

Later in the conference we discuss soil survey and the other soil researches. We get into the question of importing maize. I maintain they could grow the barley for pig feed instead of maize, and raise their own feed. He says to me, "Young man, don't fall into the fallacy that it is inherently good to import materials for secondary industrial production but inherently bad to import them for secondary agricultural production." I plead innocence of this fallacy and insist that the matter is one of using the foreign exchange in the best possible way, and that they will get more production by using their dollars for fertilizers and machinery than by using them for maize. All in all, it was quite a conference and lasted for about an hour and a half. 1/

1/ Added later: When I saw Dr. Walsh about a month later, he told me that the Minister proposed a fertilizer program, of the kind I advocated, in the Dial three days later, and quoted me in the debate. Apparently he was acting as devil's advocate all the time to get some arguments. He also substantially increased the allotments for soil research, including soil survey.

Mrs. Kellogg and I have lunch with Dr. Walsh and Henry Spain. Mr. Spain is very much interested in the expansion of the advisory service. This had been arranged for by the Minister and the money set aside, but the Society of Agricultural Technicians insisted that the salaries were too low and refused to take the positions. Obviously, someone has to give ground, and the Minister is a very strong man. Although the salaries were low, it is too bad that the program didn't get started for a year or two before this argument became too serious. Certainly the advisory work is urgently needed.

Thus, we don't leave Dublin until 4:20 p.m. We drive south along the coast toward Wexford. Near Bray we pass some nice homes and parks.

I look at a Brown Forest soil from glacial gravels, partly calcareous.

Beyond Wicklow, we pass a beautiful broad valley of farm land and forest developed from shaly glacial drift. We stop for a moment at the home of the famous Irish patriot, Parnell, and at the memorial to Thomas Moore.

We continue through the Vale of Avoca toward Arklow on a beautiful winding road. On either side are hilly, forested soils, mainly from granite.

Beyond Arklow, the land is gently undulating to rolling. Some of it from marine sediments near the sea is wet. I see some

Brown Forest soils ("brown earth") from granite far to the west near the mountains. This soil from marine clays is a difficult one according to Dr. Walsh. The alkaline, salty clay is mottled to the surface and imperfectly drained, even on slopes of 3 or 4 percent.

To the east, beyond Arklow, some of the hills are basic igneous rocks. The road passes over an area of Brown Forest soil on a mixture of glaciated diorite and shale. The soil has a deep brown, mellow profile. It is acid and low in phosphorus, and is a high phosphorus fixer; but is an excellent soil for barley. This general kind of soil is said to be important in the area around Wexford. I see more of it as we pass Gorey and go on to Ferns. There is a great deal of barley, wheat, oats, and pasture on this relatively uniform brown soil.

As we pass Ferns, I get a glimpse of the ruins of an old pre-Norman castle. The Slaney River is said to be excellent for salmon.

I look at a soil called an immature Podzol, having a surface 10 inches of grayish-brown light loam with mixed fine blocky and granular structure. The A-B transition is about 4 to 5 inches. The B, to nearly 36 inches, is a strong brown (7.5YR 5/8) soft finely granular loam. The parent material is a fairly compact gravelly and angular cobbly till, yellowish-gray in color.

Some of the land is not stony. Where I examine it, the soil is strongly sloping, but part is only moderately sloping. This soil does not fix phosphorus so much as the Brown Forest soil. The A_1 here may have been thickened as a result of cultivation. I don't see why it shouldn't go with our Brown Podzolic group, but it is too late to examine it any further.

We arrive at White's Hotel in Wexford about 8:10. After dinner with Dr. Walsh, Mommy and I take a short walk, and then to bed.



Compiled drawn and Heliographed at O.S., 1919
and printed at W.O., 1934.

ARMY MAP SERVICE, U. S. ARMY, WASHINGTON, D. C. 105476
REPRINT 1942

INDEX TO BOUNDARIES
IRELAND

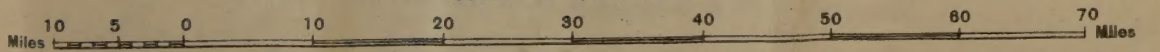


INDEX TO ADJOINING SHEETS

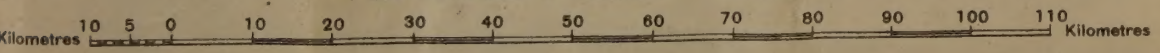
STORNOWAY O. 29	ABERDEEN O. 30
54° N. 54° N.	EDINBURGH N. 30
CORK M. 29	LONDON M. 30

Projection of the International Map

Scale 1:1,000,000



1 Inch = 15.78 Miles & 1 Millimetre = 1 Kilometre



Authority

Ordnance Survey of Great Britain and Ireland (One Inch Map)

IRELAND

N5200-W600/400x60

June 29

This is a cool, gray, drizzly morning. Today is some sort of holiday in Wexford, so things are a bit late. Then, I break my favorite old pipe. We leave the hotel at 9:30 in the rain and drive southwest to the experiment station at Johnstown Castle. The soils appear to be Brown Forest soils developed from a mixed drift of shale, trap, and sandstone over limestone.

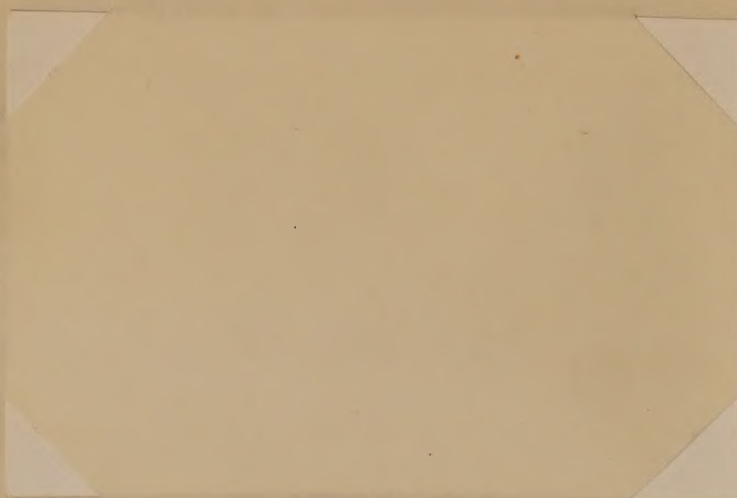
The old castle is being remodeled for offices. It was given to the Department of Agriculture for this purpose, with the understanding that the remodeling would not mar its architectural outlines, which places some severe limitations on lighting. This is an example of the way old castles are preserved without any special budget. Thus, we have the Department of Agriculture acting also as a kind of "Park Service."

The soil laboratories have been developed by remodeling some of the old stables. These laboratories are conveniently arranged and well equipped. For soils work there are 6 professional people and 23 laboratory assistants, all men, of which about 15 spend all their time on the routine work. The laboratory is now running about 400 samples a day and can go up to 150,000 annually. The "instructors" (farm advisers) call on the farmers and take the soil samples. The laboratory results go back to the instructors for recommendations to farmers. The laboratory is financed

P-XI



K-1797 June 29, 1950
Ireland. Johnstown Castle - Experiment
Station headquarters.



R-1737 June 29, 1950
Ireland, Johnstown Castle - Experiment
Station headquarters.

primarily out of funds for advisory work, but some research necessarily goes along with it. The instructors are given both written directions and demonstrations for collecting soil samples. In sampling grasslands, they take samples of the surface 3 inches, and 3 to 6 inches, and sometimes 6 to 12 inches. They composite about 20 individual samples taken at random from one soil type within one field.

Mainly, the methods recommended by Dr. Peech of Cornell are being used on samples taken by the instructors (advisers) in agriculture. They determine available phosphorus, available potassium, extractable calcium, and pH. On some samples they also determine magnesium, aluminum, and manganese.

Dr. Walsh says that the standards for phosphorus need to be lower in Ireland than in northeastern United States. Two pounds per acre of available phosphorus is often associated with good crops of oats. Fifteen pounds is very high.

Some acid soils low in calcium give very bad acidity effects while others do not. They have found no good correlation between soluble aluminum and phosphorus fixation. I am told that the method of Truog and Berger for boron does not work well. They have some boron troubles with swedes in acid soils as well as with sugarbeets. Increasing the pH of the soil worsens the boron deficiency. They even have the trouble on some farms where heavy

dressings of farm manure are used. Deficiencies of calcium appear to worsen the boron deficiencies. In their work they have found quite a bit of manganese deficiency. The addition of aluminum increases the exchangeable manganese. It can be greatly reduced by adding superphosphate or especially rock phosphate. Except for swedes, manganese deficiency, however, seems to be a greater problem than excess manganese.

They have some chlorosis that is said to look like iron chlorosis, even on acid soils; yet it is corrected by lime! They suspect that it may be caused by a high magnesium-calcium ratio.

Generally speaking, many of the clays appear to be quite well weathered and so low in calcite that magnesium is relatively high. Some of the soils seem to have a definite claypan, according to Dr. Walsh, with 12 to 14 percent of clay in the surface soil and 24 percent at 2 feet. These soils are in a hydromorphic position.

Superphosphate and basic slag decrease manganese deficiency more than rock phosphate at the beginning of the season. But later in the season, rock phosphate is more effective. Dicalcium phosphate acts very much like rock phosphate. On many of the soils in Ireland, rock phosphate is said to be a good source of phosphorus after 6 to 12 months. It seems to work better here than elsewhere (?).

Where lime has been applied, they find exchangeable sodium increases, say from 60 to 110 p.p.m.

We then go out into the field, in the rain. They have about 250 acres of field experiments. I look at some experiments on barley treated with different kinds of phosphate. Here the best results were with rock phosphate broadcast. An extensive experiment is laid out on acid soil not previously farmed for at least 100 years. The cover was mostly bracken and shrub. Barley, rye, and oats were given 4 tons of lime with various degrees of grinding. Three complete sets of plots are laid out to run for at least 20 years. In this old deer park, the soil was about pH 4.8 at the start. The soil has developed from rather stony mixed till, with quartzite, shale, and a little trap and limestone. It had about 400 to 800 pounds of available calcium to the acre.

I look at a profile in the deer park in the rain. The soil is said to be nearly freely drained.

A ₁	0-4 $\frac{1}{2}$ "	Reddish-brown (5YR 4/3) heavy sandy loam with slight "turf" mottling. The structure is mixed granular and friable subangular fine blocky.
B	4 $\frac{1}{2}$ -29"	Brown to dark brown (7.5YR 4/4) heavy loam. Poorly developed, friable subangular blocky.
C	29" +	Slightly heavy and slightly compact sandy clayey till, with streaks of clay and sand.

It rains very hard. We look at another soil said to be more poorly drained. This is due to interbedded layers of heavy clay rather than relief. The whole area is only undulating, but the till seems to me to be locally mixed and interbedded. The first two profiles I look at are sandy beneath, while the third one has no sand. Thus, the drainage complications are related to the complexity of the parent material.

We drive over to an experiment on oats where superphosphate has been used, common rock phosphate passing a 100-mesh screen, and finely ground rock phosphate passing a 300-mesh screen. The materials were applied at $1\frac{1}{2}$ and 3 cwt.^{1/} per acre, both drilled and broadcast. One and a half cwt. of superphosphate drilled gives better results than 3 cwt. of rock phosphate. But rock phosphate gives a satisfactory yield if broadcast. There was no response from the fine grinding of the rock.

All these experiments are replicated 6 times.

I see a similar one on barley, trying both ground limestone and phosphate, with superphosphate and rock phosphate at 3 cwt. per acre both drilled and broadcast, and these combined with 3 rates of liming -- 1, 2, and 3 cwt. drilled. They have poor results from drilling limestone; but superphosphate gives best results when drilled.

I look hastily at another experiment on time of application. The only good effects were had with application at seeding time.

^{1/} A hundredweight (cwt.) in Europe refers to 112 pounds.

We have lunch at Johnstown Castle with Mr. O'Sullivan, who is Superintendent of the station (Dr. Walsh gives technical direction to the soil research). At the station there are researches in agronomy and horticulture. After lunch, we take a short tour of nice gardens, including fruit trees, and of the flowers and fruits in the glasshouses.

We are back in Wexford, where I have a short interview with the local press, and start for Tipperary at 4:00 p.m. in heavy rain. For a long way the soil is undulating to gently rolling. The farms are quite good and well managed -- mainly cereals, pasture, and a few swedes and potatoes. The brown soils are developed mainly from shales; although the soil is friable throughout the solum, it is very acid. The silica-sesquioxide ratio of the clay is said to be about 2. Still these soils are not so lime deficient as soils developed from limestone at the same pH, say about 5.2 to 5.5. We should place these soils with the Brown Podzolic group.^{1/}

For quite a way the soil seems to be like that near Wexford. We pass through Newross and Waterford. The rain slackens. We pass Carrick on Suir. Here the soil is called locally the "Golden Vein." I take some pictures on an old, slightly undulating, well-drained terrace and examine a profile hastily.

^{1/} See Characteristics of Irish soil types by Gallagher, P. H., and Walsh, T. Proceedings of the Royal Irish Academy. 47B:205. 1942.

A _p	0-10"	Dark reddish-brown (5YR 3/3) sandy loam. It is somewhat gravelly. The structure is mixed granular and friable subangular medium blocky. The pH is about 8.0.
A ₃	10-17"	Transitional.
B	17-30"	Reddish-brown (5YR 4/3) gritty loam. The structure is friable granular to small granular mixed with friable weak subangular blocky. Although quite gravelly, the soil is slightly plastic when wet. Many roots. Some tongues of the B go down as far as 48 inches.
D		Nearly loose, bluish cobbles and Gravels of mixed origin, including some limestone. The large particles are very well worn.

(See photograph 71798, with Dr. Walsh.)

Dr. Walsh says that this is a good soil and fairly extensive in this part of Ireland. It is one of their best for apples. He says like soils occur also on glacial till. Although slightly podzolized, it belongs with the Brown Forest group.

We arrive at Cahir at 6:45 p.m., but only to leave our bags and go on to Bansha a few miles northwest of Cahir. Although the farms are generally good, many meadows are poor. There are so many hedges along the road that one can scarcely see the fields. Besides meadows, the main crops are barley, oats, and potatoes. Because the soils were so fertile to begin with, few of the farmers have used fertilizer, so that now about 90 percent of the



K-1798 June 29, 1950
Ireland. East of Clonmel. Slightly
podzolic Brown Forest soil, locally
called the "Golden Vein." (Dr. Walsh)

land is phosphorus deficient, about 50 percent potash deficient, and about 35 percent lime deficient, according to Dr. Walsh.

We call on the local parish priest, Father Hayes, who has a great interest in agriculture and especially in developing what he calls the "parish community." His aim is to work with farmers, laborers, and all the people in the community for the development of organizations for self-study, improvement, and recreation. On the way back to Cahir by another route, road cuts in the drift are composed of till and outwash, with fine, non-conforming material at the surface that does not appear to be loess. I see other soils, more reddish-brown than the one described, developed largely from sandstone drift. Just about dark I see some excellent pastures.

We are finally back at our hotel in Cahir very tired at 10:20 p.m.

June 30

The morning is cool, but suggests a clear day. It is as difficult to get started early in Ireland as in Australia.

Just before 10:00 a.m., we start out for Mitchelstown.

A little way out we stop to look at a gley Podzol on fairly strong slopes from red sandstone. These slopes are seepy and covered with heather and some grass. Where I examine the soil, the slope varies from 5 to 8 percent.

A ₀	1-0"	Dark reddish-brown to black peaty turf.
A ₁	0-7"	Weak red (2.5YR 4/2) light sandy loam. Although massive in place, the soil is easily friable to soft crumb and single grain.
A _{3g}	7-10"	Transitional.
G ₁	10-14"	White loamy sand; massive, compact, and brittle in place, but easily friable to single grain when removed.
G ₂	14-20"	Transitional and mottled.
C _g	20" +	Weak red (2.5YR 5/2) very compact weathered sandstone, mottled with yellowish-brown and gray, that grades into:
D		Red sandstone.

Some angular pebbles and cobbles throughout the solum.

Much of the arable land here is used for pasturing dairy cows. As we pass through Kilbeheny, many of the little carts are lined up before the creamery. The farmers bring in the milk,



K-1799 June 30, 1950
Ireland. West of Cahir. Profile of gley
Podzol on sloping red sandstone.



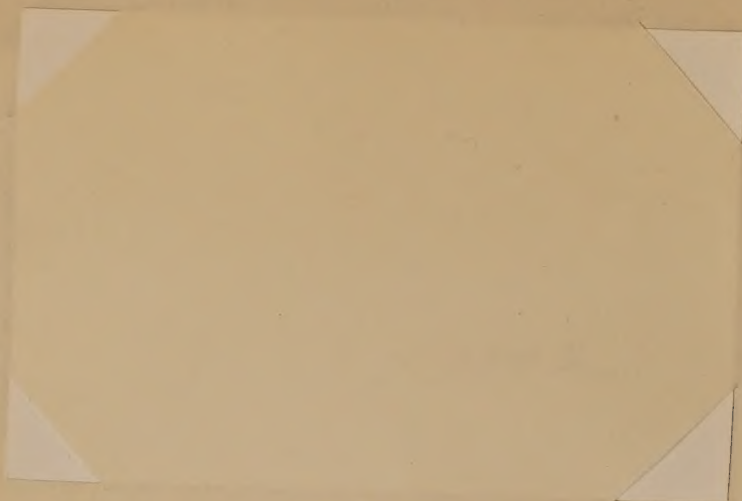
K-1801 June 30, 1950
Ireland. West of Cahir. Landscape on
gley Podzol from sloping red sandstone.
Heather with some grass.



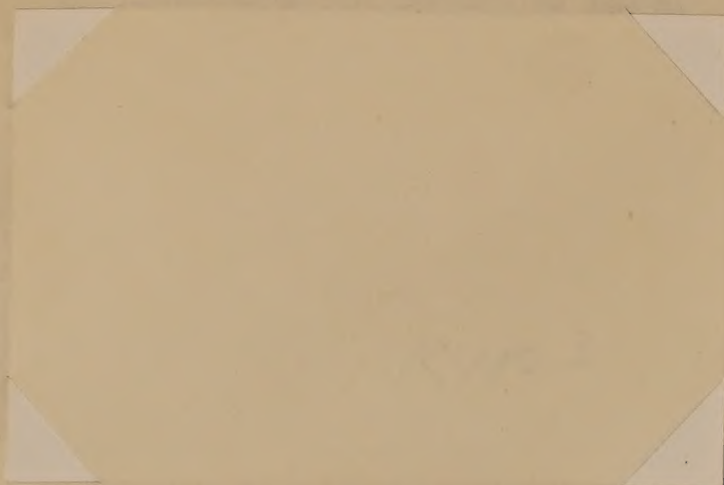
K-1802 June 30, 1950
Ireland. West of Cahir at Kilbeheny.
Waiting in turn at the creamery.



K-1803 June 30, 1950
Ireland. Near Mitchelstown. Characteristic
farmhouse and rural scene.



K-1802 June 30, 1950
Ireland. West of Galir at Killeeney.
Waiting in turn at the crossway.



K-1803 June 30, 1950
Ireland. Near Mitchelstown. Characteristic
farmhouse and rural scene.

sell the cream, and return home with the skimmed milk. Although the soils are good along here, the pastures badly need minerals. We pass Mitchelstown, another creamery center for the district.

Road cuts disclose an acid brown soil on sandstone drift that I should include with Brown Podzolic, although it shows some features of Podzol. The fields badly need lime.

We pass Glocca Maura and on to Fernoy at 11:30. Beyond are good Brown Podzolic soils on undulating terraces and thin glacial drift in the valley, along with acid gley Podzols on the hills to either side. Beyond Rathcormack is similar soil with quite good farms.

We stop at the Hotel Metropole in Cork and go on out to Munster to an experimental farm of the Department of Agriculture, Mr. Michael Sheradon, Superintendent. We walk over some of the fields of hay and other crops. I see some good hay of red clover and ryegrass following barley last year that yielded 40 cwt. per acre. Some plots went as high as 56 cwt. From my hasty examination, I call the soil Brown Podzolic, very fine sandy loam to fine sandy loam, from glacial drift derived from sandstone and some limestone lying over sandstone. On this farm are good crops of potatoes and wheat. Fields here and in the general area are very small, so that much of the space is occupied by stone walls and headlands.



K-1804 June 30, 1950
Ireland. Munster Station near Cork.
This year's hay. Soil probably Brown
Podzolic.

We have lunch at Munster and leave about 4:20 through Bardon over Brown Podzolic soil (?) from shales and slates, something like those north of Wexford.

We call at the Clonakilty Station, Mr. Gannon, Superintendent, and Mr. Cussen, Soil Scientist. After tea we walk over the farm, first to look at some new seedings of lucerne (alfalfa) of the Dupuits variety from France that was seeded this spring. The stand is good, but very weedy, and shows a suggestion of boron deficiency. I see fertilizer trials on potatoes. All the plots are so very good that it is difficult to see differences that doubtless will show in the measured yields. These are on Brown Podzolic sandy loams and heavy sandy loams developed from shale. The soils vary considerably in depth. The station has good stands of oats, barley, and wheat in both variety and fertilizer trials. The soil in the unlimed fields here runs about pH 5.0 to 5.2.

We return to the hotel in Cork in a cool but sunny evening. The countryside looks very pleasant. Much of the land is gently rolling with small fields surrounded by stone fences and hedges. I am impressed, however, by the great gap between what is being done on the station farms and what the farmers are actually doing. The biggest gap is in the application of soil minerals — lime, phosphate, and potash.

July 1

We leave Cork at 9:30 for Killarney. We drive through the grounds at the University College in Cork and then on through pleasant country to Blarney Castle. (Mommy is the only one who undertakes to kiss the Blarney Stone.) Dr. Walsh tells me that the soils in the western part of County Cork are poor, and partly because they are poor, the people are more "go ahead." They have had to scramble to get along. Although quite clannish, many from this area take jobs in the government. He says that the people in County Meath on the good soils are more lazy.

We return along the road to Cork and then to Macroon. The valleys have limestone and the hills sandstone and shale, which have contributed greatly to the drift overlying the limestone. The soils are quite acid. Most of the farms are small, say 40 to 50 acres. Large areas in the hills that could be growing trees are covered with heath and gorse. The pastures are badly in need of minerals.

Beyond Macroon is poor country with many large rock outcrops of sandstone in the valley as well as on the hill slopes. It is said that there was probably no ice here during Pleistocene.

We stop to look at a humus Podzol where peat is being cut over strong hills up to 25 percent slope. This is near "The Paps" of the Derrynasaggart Mountains. The elevation is around 900 feet



K-1805 July 1, 1950
Ireland. Blarney Castle.



K-1806 July 1, 1950
Ireland. View from Blarney Castle.

or more and the rainfall something over 60 inches. Most of the underlying rock is sandstone. On slopes, the soil has a well-developed microrelief with mounds 6 to 12 inches high and 2 to 3 feet apart. I examine a profile as follows:

(1)	0-9"	Dark reddish-brown fibrous peat.
(2)	9-17"	Nearly black, tough, mucky peat.
G	17-19"	Heavy sandy loam, reddish-brown (5YR 5/3) when wet, more gray when dry; somewhat plastic.
B _{h1}	19-19½"	Dusky red (10R 3/3) to black, brittle, but friable, ortstein.
B _{h2}	19½-25"	Dark reddish-brown (2.5YR 2/4) when wet, sandy loam; fading gradually and becoming mottled and streaked with darker colors.
C	25" +	Yellowish-brown (10YR 5/8) light gravelly sandy loam only faintly mottled.

The soil is stony and covered with some grass and heath (Erica, Vaccinium myrtillus, Nardus sp.). The roots spread out in mats just above the ortstein. In places, the ortstein is softer and thicker.

Fields are made on the less stony parts after the peat has been cut and removed. Many of the fields are obviously very old.

We pass beyond the mountains into rolling Podzol country with low terraces, probably of glacial outwash, along the rivers. The farms are a bit better because more minerals are used. Without them, the soil would produce little or nothing.

or more and the rainfall something over 60 inches. Most of the underlying rock is sandstone. On slopes, the soil has a well-developed interstitial with mounds 6 to 12 inches high and 2 to 3

feet apart. I examine a profile as follows:

(1)	0-9"	Dark reddish-brown fibrous peat.
(2)	9-17"	Nearly black, tough, waxy peat.
3	17-19"	Heavy sandy loam, reddish-brown (5YR 5/3) when wet, more gray when dry; somewhat plastic.
B ₁	19-25"	Dusky red (10YR 3/3) to black, brittle, but friable, crystalline.
B ₂	25-32"	Dark reddish-brown (5YR 5/4) when wet, sandy loam; fading gradually and becoming mottled and streaked with darker colors.
C	32" +	Yellowish-brown (10YR 5/8) light gravelly sandy loam only faintly mottled.

The soil is stony and covered with some grass and heath.

(*Erica*, *Vaccinium myrtillus*, *Mercuria* sp.). The roots spread out

in mats just above the crystalline. In places, the crystalline is

softer and thicker.

Fields are made on the less stony parts after the peat has

been cut and removed. Many of the fields are obviously very old.

We pass beyond the mountains into rolling wooded country

with low terraces, probably of glacial outwash, along the rivers.

The farms are a bit better because more minerals are used. With-

out them, the soil would produce little or nothing.



K-1807 July 1, 1950
Ireland. East of Killarney. Characteristic
small fields in stony rolling country.



K-1808 July 1, 1950
Ireland. East of Killarney. Little
pastures among rock outcrop.

P-XVIII



K-1809 July 1, 1950
Ireland. East of Killarney in hill
country. Peat cutting and pasture.

We stop at the International Hotel in Killarney and are joined at lunch by Mr. James O'Regan, an associate of Dr. Walsh.

After lunch we drive through the Bourne Vincent Memorial Park, one of the most beautiful gardens of the English type that I have ever seen. It has a host of nice old trees, great masses of rhododendrons, and large plantings of flowers, including rock gardens. But it rains. We also see some of the small, black, hardy cattle, called Cary cattle.

We are back at the hotel for dinner at 7:00 p.m., followed by a little chit-chat.

We stop at the International Hotel in Killybegs and are
joined at lunch by Mr. James O'Regan, an associate of Mr. Walsh.
After lunch we drive through the Bann Valley Memorial
Park, one of the most beautiful gardens of the English type that
I have ever seen. It has a host of nice old trees, great masses
of rhododendrons, and large plantings of flowers, including
rock gardens. But it rains. We also see some of the small,
black, hairy cattle, called Garry cattle.
We are back at the hotel for dinner at 7:00 p.m., followed
by a little chit-chat.



K-1810 July 1, 1950
Ireland. Near Killarney. Memorial park.



K-1811 July 1, 1950
Ireland. Near Killarney. (Thomas Walsh,
Mrs. Kellogg, and James O'Regan.)



K-1812 July 1, 1950
Ireland. Near Killarney. Young Podzol
under oak.

covered lithology in background, rather poor in
foreground.



K-2022 July 1, 1950
Ireland. Near Killarney. Turf cutting; heath-
covered Lithosol in background, cotton grass in
foreground.

July 2

This is a nice morning, but cool. For a while I work on my notes and then we leave for Shannon Airport at 10:30 a.m. After a few miles on the road to Mallow, we are in undulating and rolling country from old shales with peat in the lowlands and poorly drained acid soils on the hills that are difficult to improve. Most of the pastures have a high proportion of rushes like Juncus glaucus (?) and J. communis (?). Some of the uplands are well enough drained for cereals. The pastures badly need minerals and reseeded to eliminate these rushes. The soil structure is poor and the land is easily pugged by cattle. Much of the gently sloping land is nearly derelict. Farming is mostly dairying.

After a few miles, we come into better country with well-drained podzolic soils from shale on the slopes. Walsh tells me that cocksfoot or orchardgrass improves soil structure. He is now carrying on experiments to learn what stages of growth are best and so on. I note a fine crop of sugarbeet seed on a stream terrace near Mallow. Here there is a large sugar factory. North of Mallow is undulating to gently rolling Brown Podzolic soil used mainly for meadows and pasture, but with some cereals, potatoes, and sugarbeets. We pass over nearly level, imperfectly drained soils about 3 miles north of Mallow; then at 4 miles, the soil is developed from glacial drift of mixed limestone and

sandstone origin. This is a much better soil, although much of it along the roadway is rolling to strongly rolling.

We pass a quarry used for limestone, and then a large plant for grinding it operated by the sugar company. This material has about 5 percent magnesium carbonate. It is spread on farms at a flat rate of 3 shillings per ton up to a distance of 30 miles.

As we pass Buttevant, Dr. Walsh says we are in one of the best parts of Ireland. The soils are Brown Podzolic to Brown Forest from mixed limestone and sandstone drift. A fair proportion is imperfectly drained. Many of the soils are around pH 6.0 and do not respond to lime. Probably more of the soils are Brown Forest than Brown Podzolic. Some are on smooth terraces and some on gently rolling uplands. This is a part of the region in Ireland called the "Golden Vein." Fields have a reddish-brown color. There is a great deal of dairying. The best local soil types for grass have a fairly compact B horizon and suggestions of gleying. The farms are somewhat larger than elsewhere, say 60 to 120 acres. Here the drainage catena is clear, but elsewhere in Ireland the well-drained soils commonly occur in the valleys below the imperfectly drained or poorly drained soils on the slopes and hilltops! Dr. Walsh says that the people here on this good soil, used mainly for grass, are also a bit lazy.

We pass Charleville and stop for lunch at a large farm, Mr. Binchy, proprietor. Also present is Mr. Langford, adviser for the creamery association.

After lunch we go out on the pasture fields developed on Pleistocene terraces. Many of these have excellent stands of grass and white clover. This well-drained soil is perhaps a little closer to Gray-Brown Podzolic than to Brown Forest, especially the B horizon. Upland soils with heavy B horizons are subject to erosion.

Some of the pastures are on heavy, imperfectly drained clays, strongly mottled in the lower part. The surface soil here is still strongly cracked from the recent drought. Other low-lying soils would go with the Humic-Gleys. Dr. Walsh and Mr. Langford have previously worked with Mr. Binchy and have many interesting things to say. He has been renovating the pastures by reseeding timothy, New Zealand Italian rye, and white clover. But with all of them talking at once, I find it hard to get the story. As we go on, many of the pastures are on soils with brown surfaces and gley beneath. I suspect that the material was originally till, reworked by a glacial lake. At least, the soils are exceedingly complex.

Most of the fields are separated by hedges rarely kept clear of weeds. Some of these hedges associated with stone walls harbor a great many rabbits that must do a lot of damage.

In seeding the pastures, strips were seeded with different strains of grasses otherwise treated alike. The results bring out the great advantage of the new grass strains developed at the Aberystwyth Station in Britain.

A little after 4:00 we are again on our way, through Limerick to Shannon Airport. We find that our flight for tomorrow morning has been cancelled! So we are to go out tonight on a flight to leave at 9:15 that has been delayed nearly 24 hours. We say goodbye to Dr. Walsh, who must return to Dublin tonight. Certainly he has arranged an excellent tour. And such energy as this man has! "Get the idea."

I work on my notes, have some tea, and sit down to wait. Finally the plane leaves at 10:10 p.m. and lands us in London at 11:45 p.m. This day passes to the next on a bus from Heathrow Airfield to Victoria Station.

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July 3

We get a taxi to the Dorchester Hotel about 1:00 a.m., then are up early again in a cold, gray, rainy morning, as directed. But there are many delays. We are at the airfield at 12:30, into the plane at 1:05, and in the air at 1:15.

Then, when nearly to Paris, an engine fails and we return to London. We wait from 2:30 to 5:30 during a steady downpour of rain.

We leave again at 5:50 p.m. and are down in Paris at 7:00 p.m. After a long wait, we are away from Paris at 8:35 p.m. Somewhere in London I picked up some food poisoning that makes me ill during most of the trip. This day ends and another begins in the air over Portugal.



AP-11- MEDITERRANEAN SEA

July 4

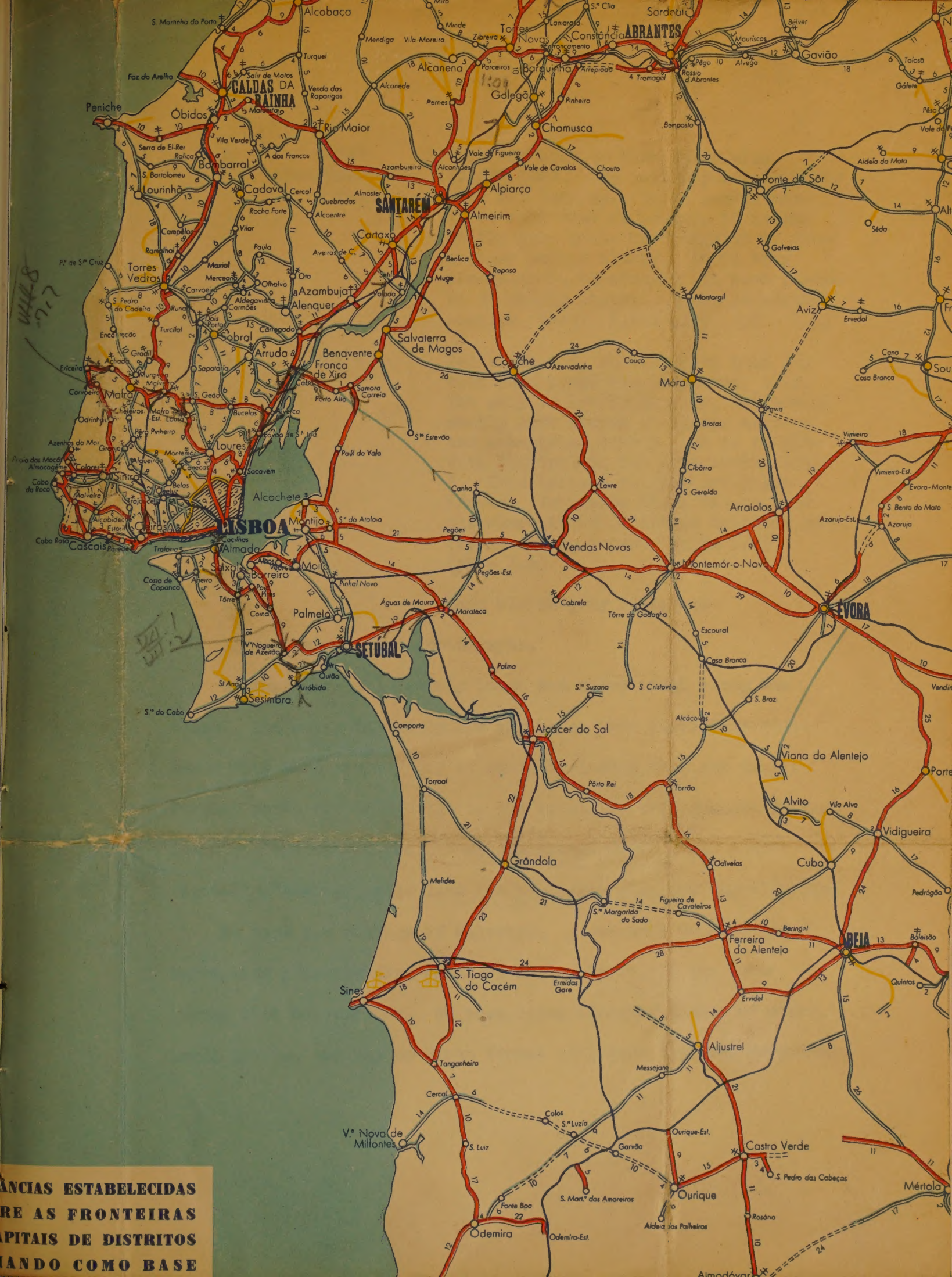
We are down in Lisbon at 1:00 a.m. Mr. Luis Bramao meets us at the airport and takes us to our hotel in (Monte) Estoril. This night I am really very tired.

We have our breakfast on the balcony of our room looking out over the Atlantic on a clear, sunny morning. Some contrast to London! Although on the Atlantic, this is characteristically Mediterranean -- the houses, the vegetation, and the blue water. About 1:00 p.m. Mr. Bramao and two of his assistants -- Fausto Sacrento-Marques and José Sacadura-Garcia -- call for us.

Within a few minutes we are on Terra Rossa soil along the coast north of Estoril. I look at it near Marinha. The land is stony and undulating on hard Jurassic limestone under oak, (Quercus coccifera), and pine, (Pinus maritima). The land has suffered erosion and no one can tell when nor how much. Like 99 percent of the Terra Rossa I have seen, the solum is exceedingly irregular. (Sample taken.)

A ₀₀ & A ₀		Very thin needles and leaves.
A ₁	0-1"	Faintly mottled weak red (10R 4/4) and red (10R 4/6) fine sandy clay loam with mixed granular and irregular subangular blocky. Mellow. In open places, this is nearly absent. (Dark red: 2.5YR 3/6) (pH - 7.2) ^{1/}
A ₂	1-6"	Dark red (2.5YR 3/6) fine sandy clay that is nearly massive in place, but breaks to irregular medium subangular blocky that is fairly friable now when nearly dry. The soil has dark stains from roots and many small holes left by roots and insects. Worm casts border some of these holes. (Red: 2.5YR 4/6) (pH - 7.1)

1/ pH in laboratory at Plant Industry Station on collected samples.



ANCIAS ESTABELECIDAS
RE AS FRONTEIRAS
APITAIS DE DISTRITOS
ANDO COMO BASE

- B 6-36" Dark red clay to fine sandy clay
(Tongues go to 8 ft.) (2.5YR 3/6). The soil appears slightly more red than A₂. It is nearly massive. Now when it is dry, it breaks easily into quite hard angular to subangular medium blocky. It is very irregular in thickness. In some places it is nearly absent. Roots penetrate easily. (Red: 2.5YR 4/8) (pH - 7.4)
- C 36" + Yellowish-red, mottled with hues and with some large red splotches, clay. The soil is nearly massive, but breaks easily into medium and large angular and subangular blocky. It is friable with difficulty, but more easily than B. This horizon is very irregular indeed. In places it is absent, and elsewhere it is 12 inches thick or more. (Appx. strong brown: 7.5YR 5/6) (pH - 7.4)
- D Hard bluish-gray limestone.

I take samples and photographs.

We then have a leisurely lunch and drive north along the ocean. The cover is mainly low shrubs on thin soils from limestone with some overcapping of sand, including some low dunes. Further north are bold hills or low mountains with granite on the top and limestone on the slopes. Although most of the native vegetation was oak, wild land now has piñon pine and umbrella pine.

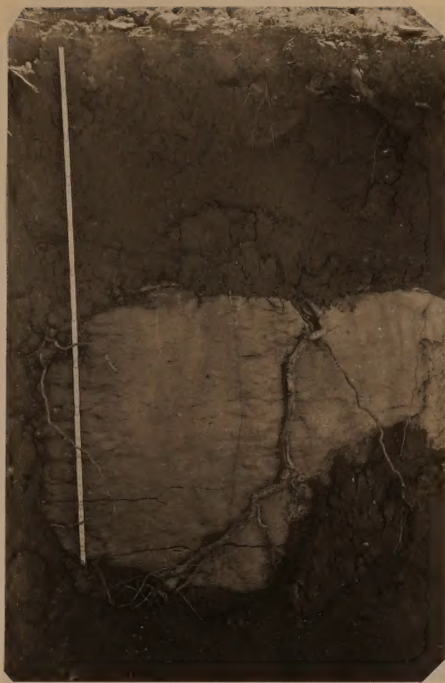
We pass the village of Malveira. I see both men and women harvesting poor-yielding wheat by hand. Certainly the labor income must be very low. We pass along terraced fields of maize, small grains, and hay on Brown Forest soil from Tertiary sandstone.



K-1813 July 4, 1950
Portugal. Estoril. From my hotel
balcony.



K-1814 July 4, 1950
Portugal. A few miles north of Estoril,
near Marinha. Landscape on Terra Rossa
where sampled. Pinus maritima and
Quercus coccifera.



K-1815 July 4, 1950
Portugal. A few miles east of Estoril.
Profile of Terra Rossa.

K-1817 July 4, 1950
Portugal. Another view of the village
of Salazar.



K-1816 July 4, 1950
Portugal. Village of Malveira.



K-1817 July 4, 1950
Portugal. Another view of the village
of Malveira.



K-2023 July 4, 1950
Portugal. North of Lisbon. Taking in the wheat that
was cut by hand.

In the hills behind, I take a hurried look at a lithosolic Brown Forest soil from granite.

A ₀	Thin	
A ₁	0-10"	Reddish-brown (5YR 4/3 - 4/4) granular loam.
A ₃	10-15"	Transitional.
B	15-24"	Pink (7.5YR 7/4) sandy clay loam with coarse vertical cracking. The soil breaks into a mixture of irregular subangular blocky and granular. This B is very irregular in thickness. In some places it is only 2 or 3 inches.
C		Gray and yellow mottled rotten granite.

In places there is evidence of a little podzolization. As we go higher in these granitic hills, I see dense stands of small pines and many huge granite boulders. The A₁ becomes thicker, up to 24 inches, and somewhat darker brown in color.

We pass through the pretty town of Sintra and see the house where Lord Byron lived. We drive east and south and return to the hotel about 6:00. After a short stop, we go on to a party at the American Embassy on the occasion of Independence Day. Here I meet again Ambassador Lincoln MacVeagh, who was our Ambassador in Greece when I was there in 1938.

We are back to the hotel a little after 10:00. Unfortunately my stomach is still upset from the food poisoning of yesterday.

July 5

The car calls for us at 9:00 a.m. and we go along the sea to Lisbon. This is a very pretty drive, with old forts built to guard against the early pirates. There are many nice homes and some government housing projects for low-income civil servants. I am told they pay about \$15.00 a month rent for 20 years and then own their place.

Except where watered, the land is dry. The highway is broad and well laid out. Many of the gardens are very beautiful with combinations of tropical, subtropical, and temperate plants, including ornamental date palms, oleanders, bougainvillea vines, olives, and many others. In the unwatered places there are various small pines and subtropical xerophytic shrubs. Most of the area is quite hilly. Near the sea are many nice bathing beaches. In spots, fishing boats are concentrated. Lisbon itself is built on seven hills. Generally, it is crowded into a small space and the street pattern is highly complicated.

I go to the office of Wagon Lit-Cook to get tickets for Paris and cancel my air reservations. This takes a long time.

I have lunch with José Sacadura and go to the American Embassy for a talk with Mr. Print Hudson, ECA officer.

He says that extension work is badly needed in Portugal and that plans are being made to send some of the advisory people to

P-XXVII



K-1820 July 5, 1950
Portugal. Sacavem. Old olive tree and
Luis Bramao.

the United States. He feels they lack fundamental ideas about how advisory work may be organized to interest farmers. He says that Portugal has a rather large staff now. The research station at Sacavem is being starved partly because of lack of interest of officials in the Ministry of Agriculture. Good working relationships between the research groups and the advisory groups seem not to exist. I wonder whether three months in the United States will really equip the advisory people in Portugal to develop the necessary philosophy to work with farmers?

We discuss these points rather thoroughly and then I return to my hotel. After dinner we have a little chit-chat with Mr. and Mrs. John R. Lundie of Renfrewshire, Scotland.

July 6

About 9:00 we leave on a field trip south of Lisbon in the direction of Setubal. We cross the ferry to Cacilhas. Soon we are on hilly sandy soil on the edge of an undulating sandy plain. The cover is mostly pine (Pinus maritima) with sparse scrubby ground cover. I am told that these sands are of Pleiocene age. The soil is a curious one. It may be a relict of a Ground-Water Podzol now ceasing to form as such, or it may represent, partly at least, very strong podzolization of an old Red Podzolic.

A ₁	0-1"	Very dark grayish-brown loose loamy coarse sand. (pH 7.0!) ^{1/}
A ₂₁	1-5 or 8"	Light yellowish-brown loose coarse sand. (pH 7.0)
A ₂₂	5 or 8-20"	Light gray, slightly coherent loamy coarse sand. (pH 7.0)

In a disturbed road cut nearby:

A ₃	20-36"	Loose gray sand. (pH 6.0)
B ₂	36-42"	Dark reddish-brown weak, but definite, ortstein. (pH 5.5)
C	42-72" +	Streaked reddish-yellow, yellow, and gray coarse sand. Massive in place. Slightly coherent, but easily dug out as relatively loose loamy sand.

Long gray tongues follow roots to several feet. The profile is very irregular.

1/ Truog-Hellige

P-XXVIII



K-1821 July 6, 1950
Portugal. On ferry boat to Cacilhas.



On field trips near Lisbon.

As we drive south, we pass road cuts with cross-bedded sandy and clayey layers. Superficially, the soil resembles a Red Podzolic. It is generally unproductive. Some of it is used for rather poor vines, maize, and peaches. Severe nitrogen deficiency is obvious. The associated sandy alluvial soils have good to excellent vegetable crops. We pass an area of fertile dark grayish-brown sandy alluvial soil that is bedded and irrigated and used for beans and cabbage. Irrigation is used in summer, but the winter rainfall is adequate for winter crops. Even here the crops have not been fertilized enough for optimum production.

We drive through a large area of this undulating podzolized sandy soil with a thin stand of pine. Only small pastures are used for crops and most of these are poor. In places, the gray sandy surface layer is nearly absent; elsewhere it is prominent; and where drainage is imperfect, the soil has a deep A_1 of medium gray.

Beyond Azeitão, the rainfall is somewhat higher. The soils belong mainly in the Brown Forest group. Most of them are hilly. I see small fields of grain, many olives, vines, and some thin soils used for sheep pasture or covered with small pines. The olive trees and vines look better here. I see a few small groves of cork oak.

A little way on we pass into hilly Terra Rossa from hard limestone. I judge that these soils, although irregular, were



K-1822 July 6, 1950
Portugal. South of Cacilhas. Bedded
alluvial soil, irrigated and drained.



K-1823 July 6, 1950
Portugal. South of Cacilhas. Local
traveller.

very thin to begin with. Besides, there has been a great deal of erosion since.

A bit further on we pass over very hilly red soils from Tertiary sandstone also called Terra Rossa locally. These soils are very thin, even under the natural undisturbed forest. Much of the natural soil is bare and normal erosion is high.

We drive down to the sea near Arrabida, and then back to the main road and east over steep, mountainous Lithosol, with small patches of lithosolic Terra Rossa. Certainly there never has been much soil on these hills. We have lunch in a small olive grove near Arrabida, famous for the remains of an old monastery. After lunch, we go east to Setubal. We pass by a cement plant. I am told that workers here get 80 cents to one dollar per day in addition to a small house and garden.

Setubal depends mainly on fishing. For some reason the sardines are scarce and the town is in bad shape economically. Many theories have been advanced for the failure of the sardines. Some say it is due to the dry years, with less organic matter from streams coming into the ocean. Others think there has been an increase in the predatory fish. A few lay the difficulty to the effects of naval warfare.

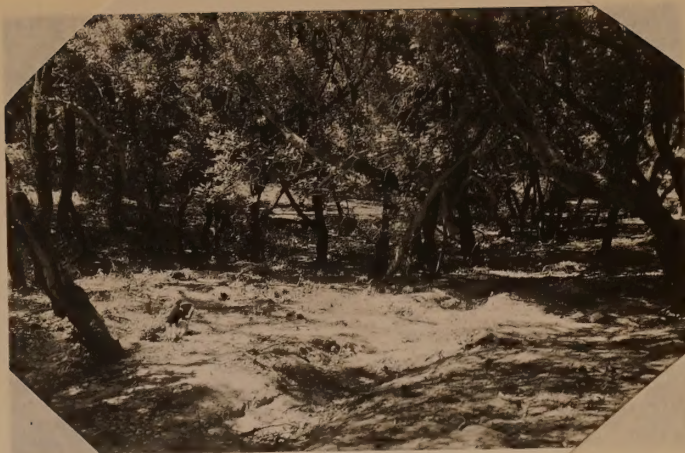
We see quite a bit of short, poor maize. It would seem to me that either rye or grain sorghum would do better.



K-1824 July 6, 1950
Portugal. Southeast of Azeitão. Eroded
Terra Rossa.



K-1825 July 6, 1950
Portugal. Road to Arrabida. Native
forest on the lower slope of hilly red
soils from Tertiary sandstone.



K-1826 July 6, 1950
Portugal. Road to Arrabida. Even under
the completely preserved natural woodland,
erosion proceeds in small rills.



K-1827 July 6, 1950
Portugal. Near Arrabida. Luncheon party.

Continuing east of Setubal, we pass some rice paddies on peaty alluvial gley soil. The uplands are podzolized sandy soil with poor maize, vines, and olives. People here are harvesting a poor bearded grass and weeds by hand for hay, leaving the soil nearly bare.

Some rice paddies have been established on old peat soils from which the peat has been removed. Generally, there is an intricate mixture of peaty soils, gley soils, and the white sandy podzolic soils in an environmental region where one should expect Terra Rossa. Some irregular rice paddies have been developed in the low, flat parts of the podzolized sandy soil.

We drive northeast from Aguas de Moura. We see large groves of old cork oak and occasionally rice paddies and fields of cereals. As the road swings north, we drive over a large area of undulating sandy podzolized soil. Where cultivated, the plowed soil is nearly white. Only a part of it is cultivated. We drive through an undulating to gently rolling area of this podzolized soil that contains large amounts of gravel and cobbles. The cork oak is thin and only a little of the soil is used for crops. Grapes do fairly well on this soil, but apparently not much else.

We drive northwest into the large flood plain of the Tejo River. Most of the soil is heavy clay. It is planned to irrigate a good deal of this. Although parts are salty, these are said to



K-1828 July 6, 1950
Portugal. South of Setubal. Rice on
peaty alluvial gley soil.



K-1829 July 6, 1950
Portugal. South of Setubal. Weeding
rice.



K-2024 July 6, 1950
Portugal. East of Setubal. Weeding rice on peaty
gley, alluvial soil. Grapes and olives on podzolized
sandy soil in background.

be easily drained. In the lower areas, dikes will be necessary to protect the soil from the tides.

At Franca de Xira we turn south toward Lisbon along the north bank of the river. The soils belong in the Brown Forest group. Much of the land is used intensively in gardens, olive groves, fig orchards, and for wheat. There are poor pastures on the hills. Active accelerated erosion is going on in places and has gone on for some time in the old olive groves. The crowns and upper roots of some of the olive trees are now exposed.

We stop for a moment at the station at Sacavem and then on to our hotel to change.

At 8:00 p.m. we leave for dinner at the residence of Ambassador MacVeigh being given in our honor. The guests include the ECA officials, others of the Embassy staff, and Mr. and Mrs. Bramao. (Mrs. Kellogg and I are the only ones not in evening clothes!) The party is very pleasant, not so stuffy as most. It is 1:30 before we are home and in bed.



K-2025 July 6, 1950
Portugal. East of Aguas de Moura. Workers returning
from rice fields. Cork oak to the left.

July 7

Today I am scheduled for some visits with officials in the Portuguese Government. I have an appointment with Caldas, Under-Secretary for Agriculture in the Ministry of Economics. I go to his office at 10:30 for our appointment. He is not in. There is much telephoning to no avail.

Next I call on the Under-Secretary for Colonies, Mr. Sa Carneiro. We have a pleasant conversation about the problems of agricultural development in Africa. He shows me a copy of a beautiful atlas on the Portuguese colonies and offers to send me a copy. We have a considerable discussion about the coordination of research on soils in Africa below the Sahara and he asks me to send him a memorandum after my discussions in Paris and Brussels.^{1/}

After lunch I go out to Sacavem and give a lecture to the staff on soil survey work, using the same outline as I used at the University of Queensland at Brisbane.^{2/}

In the evening we have dinner chez Bramao. One guest is from the Ministry of Foreign Affairs -- Dr. Vasco da Cunha -- and another runs a large contracting business and a large farm in the alluvial plain of the Tejo River -- Mr. Vaz Guedes. He tells me that he pays his workers about 80 cents a day. The

^{1/} Added later: I send the memorandum, but receive neither acknowledgment nor atlas!

^{2/} See Down-Under Journal, Vol. 1, page 83, January 18, 1949.

Outline for Lisbon speech

I. Problems of agriculture

- A. Production
- B. Conservation
- C. Living standards
- D. Full employment

II. Full use of our soils on a sustained basis

III. What is soil?

- A. Depth and area
- B. Genetic factors
- C. Landscape

IV. Soil classification units as bases for predictions

- A. Classification depends upon knowledge -- all scientific results and experience
- B. Experimental research
 - 1. Laboratory
 - 2. Field
- C. Scientific correlation
- D. Analyses of existing experience
- E. Productivity ratings
 - 1. Yield
 - 2. Management practices
 - 3. Long-time productivity

(Emphasize the importance of the ceiling of responsive soils.)

V. Extending predictions and soil maps

VI. Detail of soil surveys

A. Categorical

B. Cartographic

C. Need for accuracy

VII. Cooperation

VIII. Progress of knowledge about soil management

A. Fundamental research

B. Applied research

C. Pilot research farms

D. Demonstration farms

E. Farm planning service

more skilled ones get a dollar. A highly skilled mechanic or bulldozer operator may get as much as \$1.25.

Mr. Vaz Guedes operates his farm for milk and rice. He says it is difficult to get farmers to use machinery. On his own farm he buys a machine, but explains to the foreman that he only needs to try it. Usually the foreman has little use for it, so it is stored until a labor crisis arises, maybe in a year or two, or even three; then the foreman himself suggests they try it again. In this way he has gradually introduced various sorts of machines for spreading lime and fertilizers and for harvesting. He says the tariff rates make machinery very dear.

I am finally to bed about 11:30 after a pleasant evening.

July 8

I am up early to write two stories on Portugal, one to send home and one for the local press in Lisbon. Just after noon, I drive north of Estoril with Bramao toward Ericeira on the coast. Here there are mostly Brown Forest soils from limestone and basalt. We drive east toward Mafra, still on Brown Forest soils, with very small fields surrounded by stone walls. There is some accelerated soil erosion. Southeast of Mafra, the hilly Brown Forest soil is developed from argillaceous sandstone. Some of it gets close to the Gray-Brown Podzolic in the B.

Near Lousa, north of Loures, I see some nice irrigation of vegetable crops on alluvial soils associated with the Brown Forest soils from basalt.

We stop at Sacavem for informal discussions with the staff there, and then on to the hotel and to dinner with Mr. and Mrs. Print Hudson. The other guests include Mr. and Mrs. Bramao, Mr. and Mrs. Charles D. Hyson, and Mr. Dixon. I am sorry I didn't meet Mr. Hyson before. He is an economist with the ECA staff at Lisbon. He makes a very good impression.

I am back to my hotel at midnight.



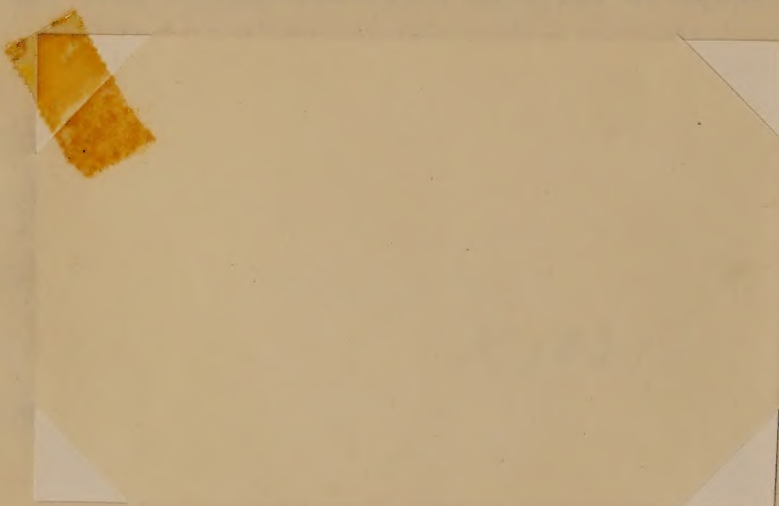
K-1830 July 8, 1950
Portugal. North of Sintra toward Ericeira.
Rural view on Brown Forest soil.



K-1831 July 8, 1950
Portugal. North of Sintra toward Ericeira.
Rural view on Brown Forest soil. Note many
stone walls.



K-1830 July 8, 1950
 Portugal. North of Sines toward Briceira.
 First view on Brown forest soil.



K-1831 July 8, 1950
 Portugal. North of Sines toward Briceira.
 First view on Brown forest soil. Note many
 stone walls.



K-1832 July 8, 1950
Portugal. North of Sintra toward Ericeira.
Rural view on Brown Forest soil. Note many
stone walls.



K-1833 July 8, 1950
Portugal. North of Sintra toward Ericeira.
Rural view on Brown Forest soil. Note
stone walls.



K-2026 July 8, 1950
Portugal. North of Sintra. Characteristic
small field with stone walls. Washing in
foreground.



K-1834 July 8, 1950
Portugal. Near Póbral. Threshing wheat.



K-1835 July 8, 1950
Portugal. Near Póbral. Another view of
threshing wheat.



K-1836 July 8, 1950
Portugal. South of Lousa. Irrigation on
alluvial soils in area of hilly Brown Forest
soils from basalt.

July 9

We are up at 7:00 a.m. to pack for the trip to Paris. Our week here has been pleasant. The days have been warm and sunny and the nights cool. Portugal is very pleasant for those who have; but a hard struggle for those who have not, in both agriculture and industry. Besides the natural conservatism of any predominantly peasant population is the added fact that most of the very rich families like things just as they are. Industry might bring strong labor unions. Active development in the African colonies might lead to ideas for freedom and separation. One senses that the rich people are thoroughly scared of communism and of the Soviet Union, but they also fear the U.S.A. and democracy, and things like the Atlantic Charter.

We go to the train and get away at 11:45. We first pass through a thickly settled area with many small gardens on alluvial soil that are partly irrigated. I see both small and large vineyards and olive groves on hilly Brown Forest soils to the east and red soils to the west. There is small grain, maize, and pasture on the heavy alluvial soils of the Tejo River. For a way the railroad goes on the river bottoms where they are a little better drained. Here there is some rather poor wheat, maize, and beans on land drained with open ditches. Garden crops are grown on the better-drained spots near the upland, with cane windbreaks

to protect them. In many fields the drainage is inadequate and some soil is a little salty. I notice some spots of wild shrub land -- probably salty.

As the flood plain broadens out, there is paddy rice and tomatoes. Maize is grown with the tomatoes to serve as wind-breaks. There is poor wheat, poor pasture, or olives on the well-drained alluvial fans and coves that extend into the broad river plain.

Just before Santa Anna Caxato, we are in rolling uplands with white surface soil. On these are thin olives and other trees and short, dry grasses. The valleys on the west have some rice.

Beyond Santarem there are many olives on the hilly Brown Forest soils and rice on some of the alluvial soils. As the land becomes more undulating, olives and wheat are grown, sometimes together and sometimes separately. Besides, I see maize, wheat, oats, and cork oak.

The first train stop is at Entron-Canento. To the north is a complex of rolling and hilly uplands and alluvial soils with olives, figs, vines, and wheat. Part of the farmers live in villages and some in scattered farms. All the farms are small, quaint, and inefficient, although crop yields are reasonably good. Reforestation is badly needed on many of the hills. Terra Rossa is conspicuous in places, and Rendzina on the soft limestone. But mainly the soils are Brown Forest.



K-2027 July 9, 1950
Portugal. West of Santa Comba Dão. Rural village
showing intensive land use, partly irrigated.





K-1837 July 9, 1950
Portugal. Village west of Mortagua.



K-1838 July 9, 1950
Portugal. Terraces on granitic slopes with
bouldery outcrops. East of Santa Comba Dão.



Bind here

Beyond Albergamba dos Doze, we are in undulating to strongly rolling country with maize, olives, vegetables, and vines, and pine trees on the hills.

Just south of Pombal is quite an area of imperfectly drained soil, gray at the surface, used for rice. Rice and some other crops here are irrigated. We pass through a rolling area and then on to another large smooth alluvial plain used mainly for rice and maize with some vegetables, or olives and vines in the highest places. Some of the rice seen along the railway is quite weedy and nitrogen deficient.

Beyond Alfarelos we are still in this large area of low river terraces mainly used for rice and maize. The higher terraces have vines, olives, maize, wheat, and a few figs. I even see a few citrus trees. A large part of the low terraces is irrigated, at least partly from wells.

Near Coimbra, the percentage of vegetables increases. We are soon out of the plain and into rolling uplands. Some of this rolling soil is reddish-brown, some light brown, and some gray. Part of it is quite hilly, eroded, and unproductive.

Beyond Pampilhosa there is much hilly forested land. Some of the pines are being used for turpentine. On the best sites, olives, vines, and irrigated maize are grown. At least some of these soils appear to be from red sandstone.



K-1839 July 9, 1950
Portugal. Another view of terraces on granitic slopes with bouldery outcrops. East of Santa Comba Dão.



K-1840 July 9, 1950
Portugal. Five miles east of Mangualde. Characteristic landscape.



K-1832 July 9, 1950
Portugal. Another view of terraces on granite
slopes with boxberry outcrops. East of Santa
Comba Dão.



K-1833 July 9, 1950
Portugal. Five miles east of Mangualde.
Characteristic landscape.

Beyond, the rocks look to be granite, although I can't be certain. Beyond Lusca, the land is very hilly and only small alluvial valleys are cultivated. We are soon into low mountains with many tunnels. Beyond are some fairly broad valleys between the hills. Many poorly cultivated steep slopes are used for very poor crops of wheat. Much of this steeply sloping soil would be more productive under forest. The small drainways down the sides of the mountains are terraced with stone walls into tiny fields, some of which are only a few square feet in area. These are used for grapes and maize. Irregular stone terraces are even seen on the bold rocky slopes covered with huge boulders and rock outcrops. One is amazed at the pains taken to build these tiny fields and irrigate them. We see similar landscapes beyond Santa Comba Dão.

Without water, it is apparently nip-and-tuck between olives, vines, and maize on the one hand, and pine used for turpentine on the other. Some of the nearly barren, rocky slopes in poor pine apparently once had soil thick enough to cultivate, judging by the old stone walls. There are still small patches of grain. People select nearly flat rock outcrops to use as thrashing floors.

Beyond Nelas, the soil is more nearly undulating and less stony; but still appears to be mostly from granite, although there may be some sandstone and schist.

Beyond Mangualde, perhaps some of the rocks are gneiss. Many of the peasant houses, barns, and especially granaries, are



K-1841 July 9, 1950
Portugal. Six miles east of Mangualde.
Characteristic farm scene -- stone walls
and terraces.



K-1842 July 9, 1950
Portugal. East of Mangualde. Farming
in stony hill land.



K-1843 July 9, 1950
Portugal. East of Mangualde. Farming
in stony hill land.

round. The walls are made of stone and the roofs are thatched. I think I never saw more hilly, stony land being cultivated.

Beyond Celorico da Beira is an area of sloping soils that are not so very stony, including strips of alluvial soils. In the uplands, the soils are light brown to yellowish-brown and appear to be sandy. Even here there are some boulders and rock outcrops. The steepest slopes are very stony. We pass along a fair-sized alluvial valley where the railway turns sharply to the south. On the hills the solum has been entirely removed and the farmers cultivate the gray, sandy C. The stream courses down the hillsides are terraced with stone walls like a series of amphitheaters. In these, springs or wells are used for irrigation. Crops are reasonably good. Where water is available, fields only 5 by 10 feet are used. The walls are $2\frac{1}{2}$ to 5 feet high, generally. Some fields are long and narrow; many are shaped like a narrow crescent.

At Guarda, I see gently rolling to hilly light brown soil that seems dry. The cover is mostly cereals and pine, except in the few small irrigated valleys with vines. After a few miles, the land to the east is stony again with many stone walls, probably not all granite. In the small irrigated alluvial terraces are nice plantings of tomatoes, beans, and other vegetables. There are quite a few vines on the high terraces and the gentle,

low slopes. A little beyond, the land is used mostly for cereals with thin pine on the roughest and stoniest parts. Some slopes are mostly rock. Large tracts have soils only along streams and near the base of the slopes. The little terraced fields running up the narrow drainways are very picturesque, but hardly efficient.

As we near the Spanish border, we pass over a rolling to hilly, very stony area having few trees and only little patches of cultivated land among the huge boulders and rock outcrops, and in the small alluvial valleys and coves.

Beyond, I see a fairly good area of undulating land with most of the stones in the walls around the fields. A few miles further, it is stony and rocky again, and so on.

At Vilar Formoso in Portugal, the Spanish officials come aboard. We cross the border into Spain about 7:17 p.m. We pass over undulating light brown to brown soil somewhat stony. The land has scattered oaks and olives in fields of small grains. Relatively large fields -- 3 to 10 acres -- are surrounded by stone walls. Some of these are irrigated from wells pumped by blind-folded donkeys. Tomatoes and other vegetables are grown in the small alluvial strips up the slopes where irrigation is possible. We pass some large pastures that are thin, but better than those just seen in Portugal. These are used for cattle and goats. The live oaks are well protected in the fields, probably to have acorns for pigs. We pass Espeja and continue about as before. The soil

is probably a little deeper and less stony. There are many oaks widely spaced, mostly live oaks, but now and then a cork oak. We seem to be in a large undulating to rolling plain. Mountains are hazy to the south. A railroad cutting shows a reddish-brown B and possibly some C_{ca} under it. There are not many houses. This is a restful landscape in evening, with the long shadows of the live oaks on the grain stubble and freshly cultivated fallow.

In other cuts, I see horizons of lime accumulation, so apparently we are on Reddish Chestnut soil. About 30 miles east of the border the live oaks drop out, except for little patches on the hills. A little further on, the soil appears to be thinner and the rocks may be partly basalt. The soil becomes more distinctly reddish-brown. Part of it is developed on old cobbly and gravelly terraces. Flocks of sheep graze the aftermath of the cereal harvest.

We pass Ciudad Rodrigo. The soil is sandy. The main crops are cereals and beans, and they are not very good. In a few miles we are in dissected country with steeply sloping soils in the hills and gently rolling ones lower down. The train goes slowly. Beyond the hilly area we enter a large undulating plain nearly all in wheat. It will probably yield about 15 bushels per acre.

As we finish dinner about 9:30 p.m., the dusk is too thick to see more. I go to bed.



July 10

I am up at 5:45 in a gray morning. The train is passing through undulating upland with quite good wheat, rye, and potatoes. At 6:15 a.m. we pass Vitoria (southwest of San Sebastián) and continue east over rolling light brown soil with gray parent material, which seems to be at least partly from sandstone. A lot of the area has alluvial soil used for wheat, maize, and potatoes in rather small fields. There are almost no stone walls or hedges.

In a little way the soil becomes reddish-brown and then dark reddish-brown. Most of it is rolling and from sedimentary rocks. The country is definitely humid. The soil gets even darker as we continue north.

The agricultural workers are just coming into the fields at 6:45. As we go on, the valley becomes somewhat narrower. Tall slender poplars make their appearance. Just west of Alsasua, I try a photograph showing the small fields at the edge of the hills to the left. These fields are at least partly irrigated. The farm buildings look quite shabby.

We leave Alsasua at 7:23 and start to climb into rugged, increasingly humid country. The cover is mostly forest and heavy shrub, with some poor grazing. The train goes through many tunnels. In a couple of miles or so I see a few cultivated



K-1844 July 10, 1950
Spain. A few miles southwest of Alsasua.
Margin of small village.



K-1845 July 10, 1950
Spain. One and a half miles southwest
of Alsasua. Small fields in lowland.

fields in the mountain valleys and on the lower slopes of hay, maize, and cereals. Hay is being made on the very steep slopes. It is very cloudy and dull; and the upper slopes of the peaks are obscured by mist. Certainly the soils must be podzolic. Nearly all harvesting is done with hand tools, yet there are some beautiful small farms in these mountains.

I try pictures again just before Zumarraga of one of these little valleys, but it may be too dark. We leave Zumarraga about 8:00 a.m. I am surprised to see a few straggly palms. The town is quite shabby, dull, and old. The little fields are neat, with very few weeds. The country is pretty. Some farms are on quite steep slopes indeed. Now there is more pine in the forest, yet it is still mainly deciduous. The train passes through many tunnels.

A few miles beyond, there are some apples and a few fields of alfalfa. Although very hilly, quite a bit of the land is farmed. For a long way we cross many streams and pass through many villages, some with small factories. At 8:30, we stop at Tolosa for a moment.

Continuing north, there is again much farming for such hilly country. Fruit increases and there is a lot of maize. Near the villages, vegetables are grown in small wall-terraced gardens. The soil is dark brown. We come into San Sebastián



K-1846 July 10, 1950
Spain. Five miles south of Zumarraga.



K-1847 July 10, 1950
Spain. Five miles south of Zumarraga.
Another view.



K-1848 July 10, 1950
Spain. Southwest of Tolosa. View of
hilly land.



K-1849 July 10, 1950
Spain. Southwest of Tolosa. Another
view of hilly land.



K-1850 July 10, 1950
Spain. North of Tolosa. Characteristic
farm scene.

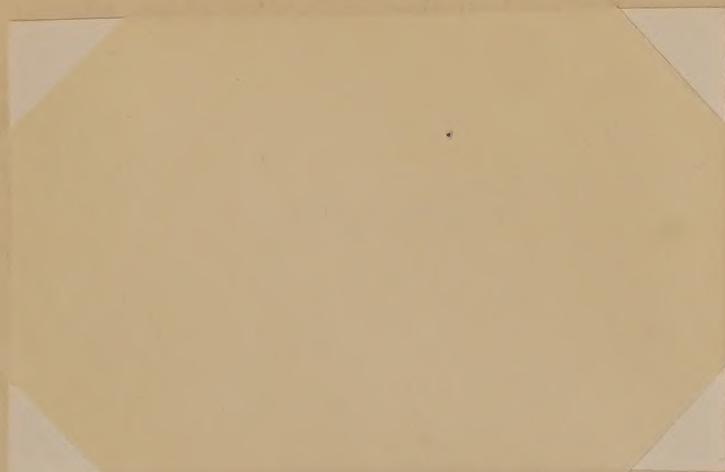


K-1851 July 10, 1950
Spain. North of Tolosa. Another view
of a characteristic farm scene.

P-11111



K-1850 July 10, 1950
Spain. North of Tolosa. Characteristic
farm scene.



K-1851 July 10, 1950
Spain. North of Tolosa. Another view
of a characteristic farm scene.

about 9:00, where we have a very small and hurried breakfast. We leave at 9:10. The sun breaks through a bit and the rolling land now looks beautiful. The buildings here are a bit better, but many are in need of repair. Most of the farms are scattered. The train approaches the border slowly.

We have a long, long wait in the switchyards and then finally pass over to Hendaye in France about 10:40. Going through customs here is very simple. On the whole, things around the station look a bit run down at the heels.

Our train for Paris leaves at 1:15 p.m. The rolling brown soil is used for vines, maize, wheat, apples, pears, alfalfa, meadows, and some forest in the steeper places.

Just before Bayonne there is quite a bit of good land, some of which needs drainage.

Shortly after Dax, we enter a large flat to gently undulating area of thin pine forest with Ground-Water Podzol. Only a little of the land is in crops; some is idle; but most is used for naval stores. We pass Caudos, still in this enormous plain of Ground-Water Podzol. I see occasional cork oaks along the railway. This plain extends to Pessac, near Bordeaux. Beyond, the land is undulating to rolling. Railway cuts suggest gravelly drift. We pass Bordeaux at 5:00 over undulating brown to light brown soil with vines, peaches, apples, and pears, often growing together.





K-1852 July 10, 1950
France. About 12 miles south of
Angouleme. Characteristic rural scene.



K-1853 July 10, 1950
France. About 10 miles south of
Angouleme. Characteristic rural scene.

There is a good deal of hay and pasture and some maize, small grains, and vegetables. Vines are most important. For 3 or 4 miles, we pass over a nearly flat area that appears to have been Pleistocene outwash.

A few miles beyond Libourne, the soil is undulating to gently rolling with more general farming, including some fruit trees and vines and a good deal of wheat, oats, hay, and pasture.

Beyond Angoulême, we pass through a nice area of general farming with some dairying. The crops are wheat, alfalfa, mixed hay, oats, sugarbeets, sunflowers, a bit of maize, some vines, tree fruits, and vegetables.

North of Ruffec, the soils are reddish-brown with spots having thin and gravelly soil. The underlying rocks appear to be sedimentary, at least partly limestone. The wheat looks good all along here. Probably 85 to 90 percent is cut.

A little way beyond Poitiers, I see quite a bit of Rendzina soil. The dusk gets too thick to see very much.

M. Aubert meets us at the railway station in Paris at 11:30 and goes with us to the hotel. It is good to see him again. After a little discussion, we arrange for our room and get to bed about 12:30 very, very tired.



July 11

In the morning I call on Dr. Mongroec McCown, the Assistant Agricultural Attache'. I have a general discussion of the purpose of my visit and he outlines some of his problems. He gives me the addresses of ECA officers who have asked for me to call. The office is quite interested in estimates of the amount of wheat harvested and its condition. In parts of northern and central France, a lot of damage has been caused by hail and wind.

Just before lunch I have a talk with Aubert about some of his problems in Africa. He gives me the names of three of his assistants whom he should like to see study in the United States, as follows:

M. Fournier, who is concerned with climatology in relation to soils, cartography, and soil-erosion control.

M. Moureaux, who is interested in soil mapping, soil classification, and soil laboratory management.

M. Moulinier, who is interested in relations between soils and crops, and especially tropical crops like those in Puerto Rico and Hawaii.

I make some appointments, return to the hotel, and then go for lunch chez Aubert. After lunch, he takes me to see Professor Henin in the Geological Museum, where we discuss arrangements for the Congress in Amsterdam and especially about the location of

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M. Fourrier, who is concerned with climatology in relation to soils, cartography, and soil-erosion control.
M. Monreux, who is interested in soil mapping, soil classification, and soil laboratory management.
M. Woulfiner, who is interested in relations between soils and crops, and especially tropical crops like those in Puerto Rico and Hawaii.

I make some appointments, return to the hotel, and then go to lunch with Aubert. After lunch, he takes me to see Professor Smith in the Geological Museum, where we discuss arrangements for a Congress in Amsterdam and especially about the location of

the next Congress. He explains his work on the soil-erosion problem in France and Europe generally. He also discusses his recent work in "experimental pedology" by which he is producing iron precipitation in soils by various means. Some of his colored photographs are quite striking. The soil is placed in tubes. If allowed access to the air, the iron precipitates in the lower part of the tube, or just above a gravel layer in the lower part. If not exposed to the air, there is no precipitation. He had some nice effects when calcium carbonate was added to the soil in the bottom part of the tube, but only if the air was allowed to enter.

I return to the hotel in the evening, and then to the home of Dr. McCown, where I meet several of the Embassy staff and from ECA. Many of these I had known in the United States, either in the Department or in the land-grant colleges.

I am early to bed tonight.

July 12

First I have a general conference in the Hotel Tallyrand with several from ECA, including A. H. Smith, W. M. Kluss, C. E. Ferguson, Tilly Allan, Brad Mills, and Caldwell. We spend most of the time discussing the proposals for technical assistance under ECA put forward by INEAC in Brussels. We also go over the British requests and those of the French in some detail. Part of the difficulty has come about from mistakes in the transliteration of technical expressions. We discuss the kinds of American scientists who might be available and the need for opposite numbers and junior staff being furnished by the other governments. We also outline the main kinds of soil problems in Africa and the general research needs. We have brief discussions about the problems in Portugal, metropolitan France, and Iceland.

After lunch I go with Aubert to the Bureau Interafricain d'Information sur la Conservation et l'Utilisation des Sols, 57, rue Cuvier, Paris (V), J. Guilloteau, Director. This meeting is not too satisfactory. At first, the Director takes the position that his bureau will be concerned with research coordination on the soil problems south of the Sahara. Aubert and I explain that this would be the function of the center at Yangambi. He then agrees and goes on to say that his bureau

will get all of the information about soils and soil conservation in the world. Aubert and I point out that this is too big a job for his small bureau and that he will need to limit his work to Africa south of the Sahara and papers from countries having like conditions, else he will be simply swamped.

I think this bureau can perform a useful service in the coordination of documentation and in explaining to the people in the various countries the kinds of research underway elsewhere. I explain in some detail the soil research problems in the Tropics, the inadequacies, and even dangers, of the ordinary concept of soil conservation, and the risks involved in trying to apply things directly to the Tropics that have been developed in the temperate regions.

I explain that the Under-Secretary for Colonies for Portugal has asked me to write him a letter appraising the work and usefulness of this bureau (which the Portuguese originally agreed to support but subsequently have not supported). I ask for a brief, simple statement, which the Director promises to send to my hotel.^{1/}

After this conference, I return to the hotel and to bed.

^{1/} Added later: When I got it, the statement was neither brief nor simple.

July 13

Early in the morning I go to the American Express and arrange for our tickets to Brussels and Amsterdam. I have a few minutes for shopping with Mommy before my next meeting.

From 10:00 a.m. to a bit after noon, I have a conference with Ben Thibodeaux, Director of the Food and Agriculture Branch of ECA, at the Hotel Bedford. This conference is mostly confidential. We have an exchange of views about Africa and Western Europe, and how ECA might best assist the agricultural services. We also discuss the work of FAO. We agree that it has done a fair job with statistics, but not so well with the general problem of production adjustment, nor with technology. Somehow, too much of the effort gets spent in conferences. Then we go into detail about prospective assistance in Africa, France, Portugal, and Iceland.

Mr. Thibodeaux outlines in summary form the present status of his thinking about economic development of Western Europe. I am exceedingly pleased that ECA has such an obviously able and intelligent officer heading up the food and agriculture program.

Just before I leave, Mr. Thibodeaux asks me to give him a list of qualified soil scientists and agriculturists who might possibly be available for his staff.^{1/}

^{1/} Added later: I prepare one copy of this list over the weekend and give it to Dr. Allan later.

After lunch, I go to the Office de la Recherche Scientifique Outre-mer for conferences with Aubert and others about the problems in Africa and the possibilities of assistance from ECA. Aubert writes out for me an exceedingly complex chart indicating a large number of autonomous or semi-autonomous agencies in France that have to do with soil research in the Tropics. We discuss the special training needs of young scientists likely to come to the United States in the ECA program.

In the early evening I call on Dr. McCown to ask that a cable be forwarded to the State Department suggesting that Mr. Bolster, Agricultural Attaché in the American Embassy at The Hague be instructed to attend the Soil Congress in Amsterdam.

I spend the evening again chez Aubert with Rossin, General Secretary of the Office for Scientific Research in the Overseas Ministry. He says that directly after the war France went too far in trying to bring democracy to the natives rapidly. This was partly because France had no material things to offer them. We have an interesting discussion of Madagascar. I agree with him that Italian farmers might be the best as settlers, at least to begin.

Rossin explains that most people in France, including farmers, have a relatively low opinion of agriculture and of people working in agricultural science. This is reflected in appropriations and in the recruitment of personnel. Actually, things are more forward looking in the Colonial Service than in metropolitan France.

Aubert's list of agencies in France having at least some responsibility for research with tropical and subtropical soils.

Ministry of Agriculture

National Agricultural Research Institute

(France, Réunion, Guyane, Martinique)

Forestry Division

School for forestry officers

Ministry of Interior

Algéria (general government)

Agricultural Research Division

Ministry of Foreign Affairs

Delegations in Tunisia and Morocco

Agricultural Research Divisions

Ministry of Public Education

Scientific Research Center for France

Natural History Museum

Division of Tropical Agriculture

Universities -- Two agricultural

Institutes with laboratories (little research)

Ministry of Overseas France

Division of Agriculture

School of Tropical Agriculture

Division of Agricultural Research (STAT)

(Soil science -- fertilizers, etc. --,

Phytopathology, Entomology, Genetics)

-2-

Scientific Research Office

Teaching centers

Paris -- first year

Adioprodoumé, near Abidjan,

Ivory Coast -- second year

Research Centers

Ivory Coast (IIRS)

Brazzaville, AEF (IEC)

(?)
Tauuanariue, Madagascar (IRSM)

Nouméa, New Caledonia (IFO)

Sections: Geophysics, Pedology, Agricultural
Entomology, Medical Entomology, Phytopathology,
Plant Genetics, Animal Genetics, Hydrology, Geology
Ethnology)

Farmer Associations

Professional Institutes for Research

Rubber -- IFC

Fruit -- IFAC

Oil Palm -- IRHO

Cotton -- IRCT

July 14

This is Bastille Day -- a national holiday in France.

We are to drive out in the country with M. and Mme. Aubert, but it rains all morning and I stay in my room to catch up on a lot of office work, including some notes for Mr. Thibodeaux.

About noon it clears a bit and we drive out to Chantilly with M. and Mme. Aubert north of Paris. Just beyond the city limits we pass through a fruit area where the trees show a great deal of chlorosis. Aubert says this is due to an excess of calcium and that the best treatment is to put colloidal iron in small holes in the trees.

Further north I notice that most of the farmers are in villages. A great deal of the soil here is quite good -- Gray-Brown Podzolic, Brown Forest, or intergrades between them, from loess. The crop rotations are mostly sugarbeets, wheat, and alfalfa; or sugarbeets, wheat, oats, and alfalfa; except for vegetables near the city. Many of the farmers have four separate fields and each of these are divided into four parts for the different crops. An attempt is being made to combine the fields together for each farm. This process of joining is called renembrer.

We arrive at the Chateau de Conde at Chantilly about 3:00 p.m. where we are joined by M. Aubert's father and mother and some of his children. M. Aubert, Sr., is a distinguished

scholar in art, Curator of the Rodin Museum in Paris and Honorary Curator of this one and others.

We take a short walk in the very nice park, and when we are at the end of our walk it begins to rain. We hurry back to the apartment and after cakes and pink lemonade leave for Paris by way of Senlis.

Early to bed.

July 15

This is another holiday, for Saturday between Bastille Day yesterday and Sunday tomorrow. I take a trip with Mrs. Kellogg to Fontainebleau to see the old chateau. We go by way of Barbizon, a famous village for painting. After a rather tiresome tour through the chateau, we have tea at Fontainebleau and return to Paris by way of Mulin.

In the evening we go to a French movie that turns out to be very poor. The Arc de Triumph and the Place de la Concord are illuminated for the holiday and there is dancing in the streets.

July 16

In the morning Mrs. Kellogg and I go out to the Church of the Sacre-Couer in Montmorte.

After a light lunch, we take a train for St. Germain and rest for a while in the park of the chateau of Henri IV. I am back in the hotel in the early evening and with a very tired back.

July 17

About 9:30 I go to the Hotel Bedford for a conference with the staff of the Food and Agriculture Division of ECA. In somewhat over $2\frac{1}{2}$ hours we try to cover the various countries of Western Europe, with particular attention to their fundamental agricultural potentialities, their advisory services, and their research services. I express some concern over so much emphasis on advisory services that the research might be neglected. This would be very serious in France, where already the research is badly starved.

At noon I meet M. Aubert and M. Bustarret, General Inspector for Agricultural Research in France. We drive out to Versailles for a very nice lunch. Afterwards, we are joined by M. Boisschot and Mr. Knoblauch and take a short tour of the station. I am told that they have about 70 professional people, of whom 10 work with soils, and 50 technicians. This group is concerned with all research done with soils and crop plants, including climatology, breeding, pathology, and entomology. Here at Versailles there is some training of advanced students. Probably one could not count more than 50 professional workers in all France concentrating on soils, fertilizers, and agronomy, of which only 10 could be full-time soil scientists. These figures are confusing to get because sometimes agronomy is used as it is in the United States and sometimes to include other things.

I try to get an estimate of what should be done to support an effective advisory program throughout metropolitan France. At the present time there are many important soil areas without any kind of experimental stations or farms. Also, at the present time, practically no work is being done in soil classification, without which good advisory work is practically impossible. In discussion, it seems that they would need about 20 experimental farms and around 10 soil-testing laboratories. Such experimental farms and laboratories would cost something like 30 to 40 million francs each. Besides this non-recurring expense, there would be needed at least 120 well-trained people for soil classification. Including all soils and agronomy, they should need about 400 scientists and 400 technicians. This would mean somewhat more than doubling the present staff.

I look hurriedly at a few experiments, including attempts at maintaining the organic matter in soil used for sugarbeets through the incorporation of about 5 metric tons of straw per hectare (equal to the straw in about one wheat crop). So far they have had classical effects -- some increase when nitrogen is used with the straw and a decrease where it is not.

In the soil laboratory I look at the work in experimental pedology explained by Henin the other day and also some work in which a young man is trying to fractionate the organic matter in

Rendzina. His coarse fraction has a carbon-nitrogen ratio of 18 and the fine fraction one of 9.

The station is still being repaired and rebuilt after severe war damage (by Americans) during which the soils laboratories were completely obliterated.

I return to Paris by train, do a little office work, and go to bed.

July 18

I call at the office of the agricultural attaché and leave him some books to send back to the United States.

I give him a summary of part of my conversations in ECA and he tells me of some of his ideas about French agriculture.

Mrs. Kellogg and I have luncheon with Mrs. Thibodeaux, along with 3 or 4 guests. Very pleasant.

At 2:00, I meet Garnier, Aubert, and Rossin. We drive out along the rue de Paris on the road toward Meaux and visit the new headquarters for the Office of Scientific Research of the Overseas Ministry. They have about 25 hectares. Some of the buildings are already in use for training junior staff. Others are under construction.

We then return to the main office of Aubert and Rossin in Paris and I look over several soil maps and other maps of Madagascar and the French areas in Africa. Aubert agrees to send me some of these.

I hurry back to the hotel in a taxi and make a quick change and go with Mrs. Kellogg for dinner with Mr. and Mrs. Finn. Also present are Mr. and Mrs. Gibbs and Mr. Lehman of the French Potash Syndicate. We have a pleasant evening.

July 18

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July 19

We are up early and pack for Brussels. Aubert is on hand to bid us goodbye. We leave the Gare du Nord exactly on schedule at 9:45 a.m.

We cross the frontier into Belgium at 12:15 p.m. below Mons and proceed directly to Brussels, where we arrive at 1:15 p.m.

We are met by M. Jurion, who takes us to the Hotel Metropole. I have a short talk with him and with M. Lebrun about the ECA projects of INEAC.

I then call on Mr. Moran of ECA at the American Embassy and explain to him my conversations with his associates in Paris. We talk about one-half hour and I go on over to the offices in INEAC. Here I go over all of the projects with Jurion, Lebrun, and Englebeen. This lasts until 7:00 p.m.

I get to the hotel in time for dinner and to meet Moran at 9:00 p.m. He drives us out to his house and we go over the INEAC proposals in detail, item by item. I try to explain to him the technical details in relation to the whole program of INEAC, ECA policy, and the available research personnel in INEAC and that might be available in the United States.

I get to bed after midnight very tired.

July 20

Jurion calls for me at 8:30 and I go with him to Louvain University. Professor Baeyens is away. We visit M. Fripiat in his laboratory where he is working on the measurement of the specific surface of clays. He tells me that he is using metaphosphate in 0.3N solution at pH 9.0 to disperse the soils. He adjusts the pH with sodium carbonate. Once dispersed, he says it is very difficult to flocculate the clays. He tells me he got this method from Tyner in the USA. He has tried Jackson's method. He now uses Jeffries' method for removing the iron. He thinks this is better than Truog's method. As one might expect, he finds the specific surface, with N absorption under vacuum, of the clays at Yangambi to be about 55 percent of the value for clays in Belgium. We discuss also the general plans for his proposed visit next autumn to the United States.

At 11:00 we are back in the offices of INEAC for a general, and I hope final, meeting on the ECA projects. Besides Lebrun, Englebeen, and Moran, there are two gentlemen from the Financial Section of the Colonial Ministry. Again, I go over the projects item by item. I explain that the botanists they are requesting may be difficult to obtain. Finally, I think we reach a satisfactory understanding.^{1/}

^{1/} Added later: Many are gradually being approved.

July 20

Junior calls for me at 8:30 and I go with him to Iannuini University. Professor Iannuini is away. We visit W. Kipphut in his laboratory where he is working on the measurement of the specific surface of clays. He tells me that he is using metaspicrite in 0.3N solution at pH 9.0 to disperse the soils. He adjusts the pH with sodium carbonate. Once dispersed, he says it is very difficult to flocculate the clays. He tells me he got this method from Tyner in the USA. He has tried Jackson's method. He now uses 'Jellies' method for removing the iron. He thinks this is better than Tyner's method. As one might expect, he finds the specific surface, with W absorption under vacuum, of the clays at Yangambi to be about 25 percent of the value for clays in Belgium. We discuss also the general plans for his proposed visit next autumn to the United States.

At 11:00 we are back in the office of INRAC for a general, and I hope final, meeting on the WSA projects. Besides Iannuini, Haghebaert, and Mornin, there are two gentlemen from the Financial Section of the Colonial Ministry. Again, I go over the projects item by item. I explain that the botanists they are requesting may be difficult to obtain. Finally, I think we reach a satisfactory understanding.

✓ Added later: Many are gradually being approved.

After lunch I have a conference in Jurion's office about soil research in Belgium, especially the soil survey program being financed by IRSIA (Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture) with Jurion, Lebrun, and Professor de Leenheer. We visit an exhibit of soil maps and soil research in the Natural History Museum. I am compelled to criticize their program and results somewhat. Work is done too mechanically. For one thing, the soils are examined and notes taken in terms of a regular grid. The soil samples are taken arbitrarily in terms of the number of hectares of each kind mapped. Samples of crops are taken from various soil types in the same field under the same management in order to get the productivity ratings. I explain that this won't do, because the ideal management for the soil types varies. They also give a bit too much weight in their soil classification to geomorphology to the neglect of texture and other soil characteristics. This gets quite unlike soils in the same series simply because they were laid down as creek fills, for example. The work is very detailed. Field mapping is done on a scale of about 1:2,000, assembled at 1:10,000 and published at 1:20,000.

We then return to INEAC and drive out to Jurion's home for dinner. Mme. Jurion and Mrs. Kellogg have had most of the day together. They seem to get along fine despite the fact that

neither knows much of the other's language. Both are very resourceful. Jurion has a beautiful new house built in 1946 and 1947, mostly of brick and stone. The stairway, the floors, and the coverings over the radiators are marble.

After an exceedingly pleasant evening, Jurion takes us back to our hotel at 10:30. Although tired, I feel satisfied with this day's work.

July 21

This is a national holiday in Belgium. About 10:00 we leave the hotel with Director General and Madame Jurion for a drive southwest of Brussels. We visit the Chateau Beloeil and then go to a farm belonging partly to Madame Jurion near Mons. We have a pleasant dinner with other guests.

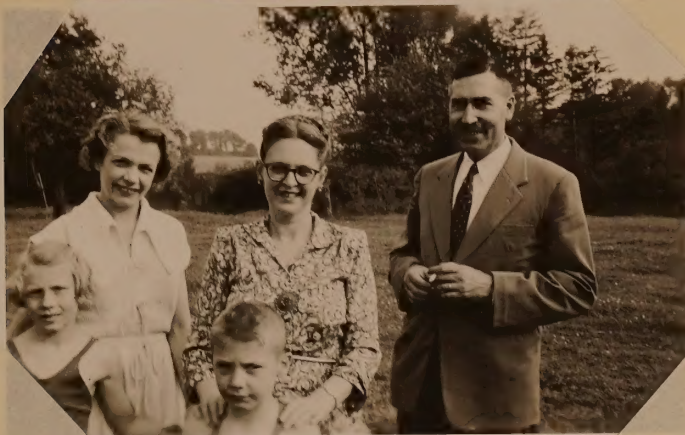
This farm is near the French border. In fact, the farmer-manager has land on both sides of the border and generally markets his products where the prices are best. That is, he markets the French crops in the best place, but does not market crops grown on the Belgium side in France, except for cattle born in France and pastured in Belgium.

Madame Jurion's brother manages a glass factory nearby and lives in the main house on the farm -- a beautiful one of the early Nineteenth Century. The Jurion's have a small apartment.

In the late afternoon we drive back to Brussels. We stop chez Jurion for a light supper and chit-chat. He takes us back to the hotel about 10:30.



K-1854 July 21, 1950
Belgium. Near Mons. Characteristic
farmyard.



K-1855 July 21, 1950
Belgium. Near Mons. Madame Jurion,
Mrs. Kellogg, Mr. Jurion and Jurion's two
children.

July 22

This promises to be a nice day for the trip to Amsterdam.

About noon the King of Belgium (Leopold III) comes back to Brussels after being away 10 years. There may be serious trouble from the trade unions and the Socialists who were against the return of the King. I hope it doesn't start before noon.^{1/}

The train leaves Brussels at 1:35 p.m. and we cross the frontier into Holland about 3:00 p.m.

There are a great many gardens near Antwerp. Over the frontier, I see mixed farming on low, flat, dark-colored soil, at least part of which is sandy. The crops are wheat, barley, oats, sugarbeets, and maize for soiling. Here there are many gardens, some of which have fruit in them. Much of the grain is harvested by hand.

We arrive in Amsterdam about 6:00 and go to the American Hotel. After a little chat with Edelman, we have a pleasant dinner and are early to bed.

^{1/} Added later: Shortly after his return there was trouble, including riots in Liege and some of the other cities. This trouble took place while we were in Holland; and upon my return to Belgium, everything was forgotten.



HEIGHTS IN METERS

reference

Names of mountain and hill ranges	Weser Gebirge
" peaks with altitudes in metres	110 Elsberg
Boundaries, international (1938)	
" " undemarcated (1938)	
" provincial	
Towns of 1st. importance	■ HAMBURG
" 2nd. "	● Odense
" 3rd. "	○ Emden
" 4th. "	○ Cuxhaven
" 5th. "	○ Hejnsvig

GLOSSARY

GERMAN

Bad	Bath, Spa
Berg, -e	Hill, Mountain
Bucht	Bay
Burg	Stronghold
Dorf	Village
Feld	Field
Fohrde	Inlet
Forst	Forest
Gebirge	Mountains
Hagen	Hedge
Haven	Harbour, Port
Kanal	Canal
Kirche	Church
Neu, -e	New
See	Lake
Stadt	Town
Tal, Thal	Valley
Wald	Wood

DUTCH

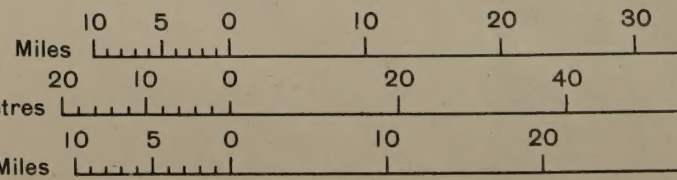
Bi	By, Near
Diep	Deep (Water)
Gat	Channel, Opening
Neder	Lower
Nieuw, -e	New
Noord	North
Oost, Ooster	East, Eastern
Op	On, Upon
West, Wester	West, Western
Zuid	South

DANISH

Aa	Rivulet, Brook
Bæk	Brook
Bjærg	Hill
Bredning	Expanse of Water
Bro	Bridge
Bugt	Bay
Rv	Town

DANISH

Fjord	Inlet, Firth
Gaard	Farm
Hage	Spit, Point of Land
Hav	Sea, Ocean
Holm	Islet
Hoved	Head
Klit	Sandhills
Lille	Small
Mose	Moss, Bog
Næs	Point, Headland
Nord, Norre	North, Northern
Ø	Island
Odde	Point, Headland
Rende	Channel
Skov	Wood
Sø	Sea, Lake
Søndre	Southern
Stor, Store	Great
Vest, Vestre	West, Western
Vig	Creek, Cove, Inl



Contours at 100 and 200 metres, and above at 200 metre intervals



HOBBS IN METERS

Various faint, illegible markings and text fragments are visible in the bottom left section of the page, possibly bleed-through from the reverse side.

July 23, 1950 by the national sections of the USA, etc.

At 10:00 a.m. I have a conference with Zuur and Edelman about plans for the conference. They insist that I am to preside for the Temporary Advisory Committee (TAC) at the business sessions of the Congress and during the first formal session while Prof. Dr. Edelman gives his presidential address.

I then hurry over to the Congress reception office and arrange for notices to be sent to all members of the United States Delegation for a meeting of the Delegation at 11:30 a.m. tomorrow in my hotel. I also register and arrange for tickets to the post-Congress excursions. Oudin, Russell, and Domingo.

After lunch, I go down to the Hotel Krasnapolsky ("Kras"). First, I have a talk with Major Ignatieff about presentation of resolutions to bring forward the FAO work on soil nomenclature.

We then have the first meeting of the TAC. Dr. Domingo acts as secretary.^{1/} Members present at this meeting include Russell (UK), Oudin (France), Tamm (Sweden), Domingo (Netherlands), Zuur (Netherlands), Bramao (Portugal), and perhaps one or two others. First there is a general discussion of various points that have to be laid before the meeting. It is agreed to accept as a starting point for the rules the Dutch synthesis of the

^{1/} Since I acted as chairman of the committee meetings of the TAC and of the business meetings of the whole Society, it was not practicable for me to keep detailed notes. The final product of these sessions will be included in Vol. III of the Transactions.

proposals made by the national sections of the USA, UK, Netherlands, Sweden, and the Soviet Union. The committee on rules is appointed to redraft this proposal for presentation, with Russell (Chairman), Domingo, Bradfield, Tamm, and Oudin.

There is then a discussion of the problem of the next congress. Oudin suggests France in '53 or '55, and the Belgians have invited the Society to Leopoldville in '54. The matter is simply discussed at this meeting, and no recommendation arrived at.

A nominating committee is selected for nominating officers and for overseeing the nominations and elections in commissions, with Kellogg (chairman), Oudin, Russell, and Domingo.

It is decided to hold a meeting of the TAC, if necessary, at 8:00 p.m. Wednesday, in the American Hotel.

This turns out to be a long meeting during which viewpoints are exchanged on all subjects that should or might come up before the Society as a whole.

D

July 24

I go over to the reception office and meet a great many of the Congress members coming in for registration. I am back at the hotel about 11:00 for a luncheon meeting of the United States Delegation. At this meeting I explain the general problems and viewpoints that will be presented at the business sessions and some of the issues involved before the rules committee. I call attention to the fact that the Soil Science Society of America and the American Government have authorized the Delegation to invite the next congress to the United States. I point out that the U. S. officers with whom I have discussed the matter in European capitals advised against holding the congress in the United States. In their view, the exchange situation would prevent the younger scientists from getting the necessary dollars for travel. The Delegation votes not to extend the invitation. We discuss the possibility of having a special meeting somewhere on soil fertility and soil testing, and I ask Drs. Bear, Parks, Hendricks, and Knoblauch to give this matter special attention for the Delegation.

In the afternoon, we go to the inaugural session and are addressed by the Hon. S. L. Mansholt, Minister of Agriculture in the Netherlands. I preside during the latter part of this session while Dr. Edelman gives his presidential address.

After dinner at the hotel, we attend a pleasant reception for Dr. D. J. Hissink, former secretary of the Society.

July 25

In the morning I go to the general sessions of the Congress and then to the special section on tropical soils.

(Since the papers are published in the Transactions of the Fourth International Congress of Soil Science, together with the most important discussions, these notes do not include reviews of the papers nor a repetition of the agenda included in the program.)

Dr. Bradfield and I have lunch and discuss some of the problems of the rules committee. After lunch, I work on the agenda for the first business session, which meets at 4:00.

Members are informed of the need for considering the rules; the members of the rules committee are announced; and members are furnished draft copies of the rules.

The members of the nominations committee are announced and sessions of this Congress are designated for the election of commission officers.

The committee is announced for selection of the site of the next Congress, after an explanation of the invitations from France and from Belgium for the Congo.

It is decided that the Society should publish a news bulletin at a cost between 1 and 6 Dutch guilders.

In redrafting the rules, the committee is given freedom to choose the contents of this new bulletin within the framework of the above motion. It is decided that membership in the

reconstituted International Society shall be open to both individuals and national sections.

Members of the rules committee are asked to redraft the constitution for presentation at the next business session to be held Sunday, July 30. At that time a report will also be had from the committee on the selection of the site of the next Congress.

It is pointed out to the Congress that the German Delegation had been invited with the understanding that they would not participate in the first business sessions until invited. A resolution is adopted to invite the German Delegation to participate in subsequent business sessions and to become members of the reorganized Society in the same way as delegates from other countries.

In the evening we attend a government reception in the Rijksmuseum.

July 26

I am up early this morning to work up an outline for my lecture on tropical soils. I go first to the general lecture on the program and then to the session on tropical soils, which is not too good.

I have lunch with Norman Taylor and others near the reception office and give my general lecture on tropical soils in the afternoon. It seems to go well.

I have an early dinner and I am early to bed.

July 27

In the morning we have a discussion of some of the problems of soil nomenclature and terminology at the general sessions and then take a field trip to the Gooi-region and Noordwijk.

We drive out through Amsterdam and stop first to look at a fairly well decomposed peat soil underlain with bluish-gray clay streaked with brown at about 1 meter. The truly organic soil is around 12 to 18 inches deep. I have trouble with my camera at this first stop. At the second stop, the surface 10 inches of soil is a dark grayish-brown silty clay loam underlain by a dark gray layer that is chiefly silt. At around 2 feet, the soil is compact loamy fine sand, gray in the upper part, with increasing fine to medium mottling with reddish-brown beneath.

We drive through the bulb-growing section to the west on excavated dune sand. The water table is controlled at approximately 55 centimeters. Large amounts of farm manure are used about every 3 years, together with chemical fertilizers containing N, P, and K. Small rows of oats are grown among the bulbs for windbreaks. Besides, some vegetables are grown in rotation. Near Hillegom some of the farmers grow as many as three crops of bulbs in succession before interruption with another crop.

We make another brief stop -- the fourth -- and see an example of the removal of the dune sand down to a level of 55 centimeters above the water table. These dunes carry a slightly

July 27

In the morning we have a discussion of some of the problems of soil nomenclature and terminology at the general sessions and then take a field trip to the Gool-region and Noordwijk. We drive out through Amsterdam and stop first to look at a fairly well decomposed peat soil underlain with bluish-gray clay streaked with brown at about 1 meter. The truly organic soil is around 12 to 15 inches deep. I have trouble with my camera at this first stop. At the second stop, the surface 10 inches of soil is a dark grayish-brown silty clay loam underlain by a dark gray layer that is chiefly silt. At around 2 feet, the soil is compact loamy fine sand, gray in the upper part, with increasing fine to medium mottling with reddish-brown beneath. We drive through the bulb-growing section to the west on excavated dune sand. The water table is controlled at approximately 25 centimeters. Large amounts of farm manure are used about every 3 years, together with chemical fertilizers containing N, P, and K. Small rows of oats are grown among the bulbs for windbreaks. Besides, some vegetables are grown in rotation. Near Hillegom some of the farmers grow as many as three crops of bulbs in succession before interruption with another crop. We make another brief stop -- the fourth -- and see an example of the removal of the dune sand down to a level of 25 centimeters above the water table. These dunes carry a slightly

podzolized soil. The sand is calcareous. Within the sand dunes are occasional organic-rich layers.

Then we drive on to have tea as the guests of the Association of Bulb Growers near the sea.

I go back in a very rough bus. I see that my back will not stand much of this.

I have dinner and a talk about the soil survey problems in Belgium with Tavernier, de Leenheer, and Vandecaveye.



K-1856 July 27, 1950
Holland. West of Amsterdam. Prof. Dr.
C. H. Edelman explains.



K-1857 July 27, 1950
Holland. Near Amsterdam. Party waits
for bus. Mrs. Kellogg, Dr. Russell, Dr. Walsh,
Dr. Crowther (facing center).

K-1857 July 27, 1950
Holland. A group of people



K-1858 July 27, 1950
Holland. West of Amsterdam. View on
peat, one meter over clay.



K-1859 July 27, 1950
Holland. A tour stop.



K-1860 July 27, 1950
Holland. Sir E. John Russell, center, and Prof. Dr. Edelman.



K-1861 July 27, 1950
Holland. Dr. Thomas Walsh and
Dr. A. B. Stewart.



K-1862 July 27, 1950
Holland. Prof. Henin and Dr. M. B. Russell.



K-1863 July 27, 1950
Holland. Sugar beets.

P-LVI



K-1864 July 27, 1950
Holland. Wheat.



K-1865 July 27, 1950
Holland. Another view of wheat.



K-1866 July 27, 1950
Holland. Bulb growing on excavated
dune sand.



K-1867 July 27, 1950
Holland. Another view of bulb growing
on excavated dune sand.

P-LVIII



K-1868 July 27, 1950
Holland. Excavating dunes to proper
depth for bulb growing



Russell and Kellogg. Haarlemmerweer, Holland.
July 27, second profile. (Photos by A. G. Norman)

19 Norman
July 27

Harlemmerweert
Holland

7451

July 27, second profile. (Photos by A. G. Norman)
Russell and Kellogg. Harlemmerweert, Holland.

July 28

In the morning we have a special meeting of the tropical soils group and discuss nomenclature. I go over to hear Schoefield's paper and then spend the rest of the time in the tropical soils section.

In the evening, Mrs. Kellogg and I are dinner guests of Dr. Greene, and later we join a party given by Edelman at the Krasnapolsky Hotel.

July 29

The morning session is devoted to papers on the development of soil science in the Netherlands. The last part of Zuur's paper (which he credits to Visser!) is an absolute nightmare of false assumptions and non-logical reasoning. It seems a pity that this will likely appear in the publications of the Congress.

I look at the exhibits put up by the Dutch Organizing Committee and have lunch with Bradfield, Jurion, and Edelman.

After lunch we are taken on a boat trip in the canals around Amsterdam, which is over in time for about an hour in the book shops. (I buy as many as Mommy's bag will hold!)

In the evening I go down to the Krasnapolsky for dinner with Greene, Nye, Ignatieff, and Russell. This is followed by a short meeting of the United States Delegation.

Section for tropical and subtropical soils.

Nomenclature.

To facilitate the discussions at the meetings of the section for tropical and subtropical soils, the former secretary Prof. Hardon, has proposed to prepare a list of names of tropical and subtropical soils, at approximately the "great soil group" level.

Since many members are interested in this problem, suggesting a full discussion at the meetings on the naming of tropical and subtropical great soil groups, I arranged a discussion on Monday, July 31st.

I deliver herewith a tentative scheme for tropical and subtropical soil classification in the higher categories, being a recapitulation of suggestions of several soil experts.

Following, a list is presented of local names in alphabetical order for every soil group, with the names of the countries where they are used.

List and scheme do not aim at a large degree of accuracy or completeness. The only intention is to help the discussions on the matter at the meetings.

We are indebted to many colleagues from foreign tropical countries for their constructive contributions concerning soil types and properties in their regions.

The Secretary of the Section for
tropical and subtropical soils

H. A. Middelburg.

Classification of tropical and subtropical soils.

Order	Suborder	Great soil groups
Zonal	humid regions	1. ^a podzolic yellow soils with black humic topsoil
		1. ^b red-yellow podzolic soils
		2. non-laterized red soils, $\frac{SiO_2}{R_2O_3} > 2$
		3. laterized red soils, $\frac{SiO_2}{R_2O_3} < 2$
		4. degraded grey and black clay soils
		5. illuvial grey and black clay soils
		} catenary association
Intrazonal	arid regions	6. red desert soils
		7. dark desert soils
		} catenary association
	calcimorphic	8. red (calcareous) soils over limestone
		9. black calcareous soils over limestone
		10. red (calcareous) soils over marls
		11. black calcareous soils over marls
		} catenary association
	halomorphic	12. saline soils
	hydromorphic	13. groundwater lateritic soils
		14. planosols
		15. organic soils
Azonal		16. lithosols
		17. regosols (ash, loess, dry sands)
		18. alluvial soils

1.^a podzolic yellow soils with black humic topsoil.

Ando (Japan)
Hooggebergtegronden (Indonesia)
Tropical brown forest (St. Vincent, Hawaii, Japan)
Zwarte stofgrond (Sumatra)

1.^b red yellow podzolic soils.

Cecil-soil (U.S.A.)
Clarksville soil (U.S.A.)
Grey-brown and red-yellow podzolic (Puerto Rico)
Podzolized yellow and red earth (China, Hawaii)
Red-yellow podzolic (China)
Yellow-earth (Trinidad)
Yellow-lateritic (Hawaii, East Africa, Assam)

2. non-laterized red soils.

Brown earth (Trinidad)
Brown lateritic (Hawaii fans, Formosa terraces)
Bruine stofgrond (Indonesia)
Reddish-brown lateritic soil (Puerto Rico)
Red lateritic, red loam, red earth (Uganda, East and South Africa, India, Abyssinia)
Yellow-brown lateritic soil (Puerto Rico)

3. laterized red soils.

Lateriet grond (Indonesia)
Laterite soil (Puerto Rico)
Lateritic yellow earth (South Africa)
Laterized red earht (East- and South Africa)
Latozol (U.S.A., Cuba, Puerto Rico)
Lixivium (Indonesia)
Nipe clay (Cuba, Puerto Rico)
Red loam (Southern Sudan)
Tanah merah (Indonesia)

4. degraded grey and black clay soils.

Changa (Zanzibar)
Ferruginous lateritic (South Africa, Siam)
Fue (Pemba)
Gedegradeerde grau- en zwartaarde (Indonesia)
Higher-lying member of the Toich catena (Sudan)
High veld podzolic (South-Africa, Rhodesia, Nigeria, Siam)
Low veld soils, higher-lying member of alkaline catena,
(South Africa, Hawaii)
Mallee soils (Australia)
Mkuzi profile (South Africa)
Messina profile (South Africa)
Piedmont regur, intermediate member of alkaline catena
(Sudan, Abyssinia)
Plateau soils (East Africa, South Africa, Rhodesia, Nigeria)
Reddish brown soils (Puerto Rico)
Reddish chestnut soils (Puerto Rico)
Reddish prairie soil (Puerto Rico)

5. illuvial grey and black clay soils.

Black and grey calcareous clays of bottom lands (East-Africa)
 Black cotton soil (India)
 Black turf (South Africa)
 Changa (Zanzibar)
 Chernozem (Puerto Rico)
 Coama clay (Puerto Rico)
 Dambo (Rhodesia)
 Ferric pedocal (South-Africa)
 Lowest member of the Toich catena (Sudan)
 Lowland regur (Sudan, East-Africa)
 Low lying member of alkaline catena (East-Africa, South Africa)
 Low veld dambo (Rhodesia, Sudan, Nigeria, East-Africa)
 Margaliet (mergel) grond (Indonesia)
 Plain soils (Sudan, East-Africa)
 Plateau soils (Sudan, East-Africa)
 Rantja minjak (Indonesia)
 Regur (Deccan of India, South-Africa, East-Africa, Sudan, Puerto Rico)
 Shachiang soil (China)
 Silcrete (Tangayika, Australia)

6. red desert soils.

Mediterranean red earth and sands (Palestine)
 Red desert soil (Puerto Rico, East-Africa, Sudan, U.S.A.)

7. dark desert soils.

8. red (calcareous) soils over limestone.

Caustal plain latosol (Puerto Rico)
 Kinongo (Zanzibar)
 Red desert (Puerto Rico)
 Terra rossa (Mediterranean, Indonesia)

9. black calcareous soils over limestone.

Kalkzwartearde (Indonesia)
 Kinongo (Zanzibar)

10. red (calcareous) soils over marls.

Brown rendzina soils (Puerto Rico)
 Bruine margaliet (mergel) grond (Indonesia)
 Namo (Zanzibar)
 Rendzina (Australia)

11. Black calcareous soils over marls.

Black rendzina soils (Puerto Rico)
 Namo (Zanzibar)
 Rantja minjak (Indonesia)
 Rendzina (Australia)
 Zwarte margaliet (mergel) grond (Indonesia)

12. saline soils.

Deb deb (Algerie)
Gezira soils (Sudan)
Regur saline (Sudan)
Tanah assinan (Indonesia)
Zoutgronden (Indonesia)

13. groundwater lateritic soils.

Buchanan's laterite (South India, Sudan, Siam, Amazon,
Low level laterite (India) China)
Mottled clay (East-Africa)
"Ouklip" soils (South-Africa)
Paddy soils (China)
Sabana seca sandy clay loam (Puerto Rico)
Sawah-gronden (Indonesia)

14. planosols.

Desert delta soil (India)
Shoal (Trinidad)
Sawah-gronden (Indonesia)
Terras (Trinidad)
Vlei soils (South-Africa)

15. organic soils.

Upland peats.

16. lithosols.

Humic lithosols (Hawaii, Basutoland, St.Vincent,
East-Africa)

17. regosols.

Asgrond (Indonesia)
Goz soils (Sudan)

18. alluvial soils.

1. Color and structure of people
2. How salt exists in relation to assoc
3. Associated genetic factors {geography}

4. Chemical data

pH
exchange base

Sometimes:

Temperature
Salt content

July 30

In the morning I have a conference with Dr. Jóhannesson about my proposed visit to Iceland after the Congress. Then we all have lunch with the Bradfields, and this is followed by more discussion of the problems in Iceland.

In the afternoon I prepare my notes for the second business meeting of the Society. This is an extra one not included in the official program. At this meeting we hear the second report of the committee on rules, and a preliminary one of the committee for the selection of the site of the next Congress. Further instructions are given for the election of commission officers and also for the election of representatives of the personal members that are to represent those members of the International Society that do not belong to national sections.

Following the business meeting, I sit with the committee on the next Congress and also with the nominating committee. This committee is presented with a serious problem of eliminating duplications of nominees among commissions and of balancing the commission officers as a whole among the countries and continents. This has required several side conferences with the chairmen of the individual commissions.

Very late to bed.

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Very late to bed.

July 31

In the very early morning I go with Norman Taylor to the American Consulate in order to arrange for him to have an official American visa for travel to the United States. Then I go on for a while to the session on land classification, and then to the program on shifting cultivation.

After lunch I again attend the meeting of the tropical soils section.

I have a dinner conference with Edelman, and then spend the rest of the evening in meetings of the nominating committee along with the chairmen of the various commissions and committees.

Again very late to bed.

August 1

In the morning Russell, Oudin, Domingo, Edelman, Zuur, and others work with me on the agenda for the third and final business session of the Congress.

This session is held shortly after lunch.

First of all, we have the report of the rules committee, of which each member has a copy in his hand. After some discussion from the floor, minor changes are suggested. The rules are adopted with the understanding that the drafting committee will make some modifications in order to incorporate the last-minute suggestions. It is also understood that the executive committee might make further changes that will be circulated in the Council and presented to the membership at the next congress.

This is followed by a motion adopting the new rules for reorganization of the Society as acceptable to those members who were members before 1939. The motion also provides for the transfer of all funds and property to the new secretary.

The decision is taken to hold the next congress -- the Fifth Congress -- in Leopoldville in 1954. It is agreed to advise the Council to try to arrange for the Sixth Congress to be held in France at a time convenient to the Society and to the French Government. It is decided to ask the Council to try to arrange a meeting of the commission on soil fertility and plant nutrition in 1952 or 53, probably in Ireland.

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REPORT OF THE FOURTH INTERNATIONAL CONGRESS OF SOIL SCIENCE

Amsterdam, The Netherlands, July 24-Aug. 1

Prepared for the Department of State by the United States Delegation

THIS CONGRESS OF SOIL SCIENCE was one of a long series of conferences and congresses extending back nearly 50 years. After the First World War the old international organization of soil science was reorganized as the International Society of Soil Science at a meeting in Rome in 1924. The decision was taken to hold the First International Congress under the auspices of the new Society in Washington, D.C. in 1927. The Second International Congress of Soil Science was held in Moscow in the Soviet Union in 1930. The Third Congress was held in Oxford, England, in 1935. At that time it was planned to hold the next Congress in Germany in 1940. Of course, this was interrupted by World War II. In addition to these general meetings, the International Society of Soil Science also published journals and held smaller conferences on specific phases of soil science between the general congresses.

The permanent Secretary of the Society had his headquarters in Holland, and the Society became essentially inoperative after the invasion of that country by the Germans. After the war, several soil scientists all over the world began to correspond with one another about reorganizing the Society and holding a Fourth International Congress. The French Government invited a large group of foreign soil scientists

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as their guests in the summer of 1947. This gave an excellent opportunity for preliminary discussions leading to reorganization of the Society, and a meeting for the purpose was held.

Several national societies had representatives at this meeting in Paris in 1947, where general plans were made for the holding of the Fourth International Congress of Soil Science and for reorganization of the International Society of Soil Science. The decision was taken to withhold any other attempts, including any attempts of the old officers, to get the Society going prior to the Fourth Congress. The Dutch representatives at the Paris meeting put forward an invitation for the Fourth International Congress of Soil Science to meet in The Netherlands in 1950. They exhibited documents showing that the proposal had the approval of both their local Society and the Dutch Ministry of Agriculture. The invitation was accepted.

The Dutch Organizing Committee, with Prof. Dr. C. H. Edelman as Chairman, took responsibility for all details of arrangement for the meetings, demonstrations, and publications (essentially at cost). It was also provided at the Paris meeting that a Temporary Advisory Committee with representatives of the soil scientists of 14 nations be named simply to give the Dutch Organizing Committee any advice they might require for organizing the Congress and for conducting its meetings. It turned out that this Committee had few duties to perform other than more or less individual advice to Prof. Dr. Edelman and his associates about soil scientists most qualified to give general lectures at the Congress. At the
meeting

meeting in Amsterdam, this Committee took responsibility for organizing the business sessions of the Congress at which the revised rules were debated and adopted.

Since the political situation was still confused in 1947, it was agreed that all political questions should be referred by the Dutch Organizing Committee to their own Foreign Ministry, since obviously no group of scientists could deal with such questions, and that invitations for governments to take notice of the Congress and to assist soil scientists in attending be sent through the Dutch Foreign Ministry to all governments with which the Dutch Government had normal diplomatic relations. Accordingly, all such governments were officially invited during 1949, including the Government of the United States. Upon recommendation of the Secretary of Agriculture, the Secretary of State designated several distinguished soil scientists in the United States as official delegates to the Congress and designated two as advisers.

It could be said that the program of the Congress was divided into two parts. The main emphasis was upon a program of scientific papers, most of which are included in Vols. I and II of the Transactions of the Fourth International Congress of Soil Science, published in Groningen, Holland, 1950. One additional volume of discussions and last-minute papers is in press.^{1/} The other part of the meeting dealt with the revisions of the constitution, election of officers, and suggestions for the

^{1/} Copies of these Transactions are not attached. They were available only to individuals of paid membership and are devoted wholly to scientific matters. Copies can be obtained at around \$15.00 or \$20.00 a set.

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next meeting place. The final printed statements are not yet ready for distribution.

The Society is now organized partly on an individual membership basis and partly on the basis of national sections. It is wholly non-governmental.

Agenda. The agenda provided for a few general programs of broad interest and several sectional meetings as follows: (1) soil physics, (2) clay minerals, (3) soil chemistry, (4) soil biology, (5) saline soils, (6) soil fertility, (7) tropical and subtropical soils, (8) soil conservation, and (9) land classification. Besides the official program, copy attached, there were many informal meetings of individuals having particular specialized scientific interests.

Participation. About 600 delegates were in attendance from the following countries: Australia, Austria, Belgium, Canada, Denmark, Ireland, Egypt, Finland, France, Germany, Great Britain, India, Israel, Iceland, Italy, Kenya (East Africa), Mexico, Netherlands, New Zealand, Norway, Portugal, Portugese East Africa, South Africa, Southern Rhodesia, Spain, Surinam, Sweden, Switzerland, Turkey, United States of America, Yugoslavia, and Zanzibar. Although a leading country in soil research, soil scientists of the Soviet Union were unable to accept the Dutch invitation to attend.

United States Delegation. The United States Delegation was as follows:^{2/}

Chairman: Dr. Charles E. Kellogg
Chief, Division of Soil Survey
Bureau of Plant Industry, Soils, and
Agricultural Engineering
Agricultural Research Administration
Department of Agriculture

^{2/} Several United States soil scientists, who had been designated as official delegates, were unable to attend. Some had to change their plans during the weeks just preceding the Congress. Those designated were distinguished scientists and very busy, especially during the crop-growing season. Further, several had no sources of funds for the journey except personal ones.

Vice Chairman

Vice Chairman: Dr. Richard Bradfield
Head, Department of Agronomy
Cornell University
Ithaca, New York

Delegates: Mr. James Kenneth Ableiter
Chief Soil Correlator
Bureau of Plant Industry, Soils, and
Agricultural Engineering
Agricultural Research Administration
Department of Agriculture

Dr. Firman Edward Bear
Head, Department of Soils
Rutgers University
New Brunswick, New Jersey

Dr. Francis Eugene Clark
Senior Bacteriologist
Bureau of Plant Industry, Soils, and
Agricultural Engineering
Agricultural Research Administration
Department of Agriculture

Dr. Sterling Brown Hendricks
Head Soil Scientist
Bureau of Plant Industry, Soils, and
Agricultural Engineering
Agricultural Research Administration
Department of Agriculture

Mr. Roy Douglas Hockensmith
Chief, Soil Conservation Surveys Division
Soil Conservation Service
Department of Agriculture

Dr. Harold Carl Knoblauch
Assistant Chief, Office of Experiment Stations
Agricultural Research Administration
Department of Agriculture

Dr. Arthur Geoffrey Norman
Chief, C Division, Chemical Corps
Camp Dietrick
Frederick, Maryland

Dr. Robert Quinn Parks

Vice Chairman: Dr. Richard B. Griffiths
Head, Department of Agronomy
Cornell University
Ithaca, New York

Delegates:
Mr. John Kenneth Whitson
Chief S. I. Committee
Bureau of Plant Industry, S. I. C.
Agricultural Experiment Station
Department of Agriculture

Dr. Thomas Edward Rose
Head, Department of S. I. C.
Cornell University
New Brunswick, New Jersey

Dr. Francis Eugene Clark
Sector Representative
Bureau of Plant Industry, S. I. C.
Agricultural Experiment Station
Department of Agriculture

Dr. Gerald Brown MacIntosh
Head S. I. Committee
Bureau of Plant Industry, S. I. C.
Agricultural Experiment Station
Department of Agriculture

Mr. S. D. Jones
Chief, S. I. Committee
S. I. C. Division
Department of Agriculture

Mr. Harold Carl Whitson
Assistant Chief, Office of Experiment Stations
Agricultural Experiment Station
Department of Agriculture

Mr. Arthur Geoffrey Brown
Chief, S. I. Division, General Corps
Camp Belvoir
Frederick, Maryland

Dr. R. H. Jones

Dr. Robert Quinn Parks
Assistant Head, Division of Soil Management
and Irrigation
Bureau of Plant Industry, Soils, and
Agricultural Engineering
Agricultural Research Administration
Department of Agriculture

Dr. Lorenzo Adolph Richards
Principal Soil Physicist
Bureau of Plant Industry, Soils, and
Agricultural Engineering
Agricultural Research Administration
U. S. Regional Salinity and Rubidoux Laboratories
Riverside, California

Dr. Silvere Cyril Vandecaveye
Professor of Soils
State College of Washington
Pullman, Washington

Advisers: Dr. Samuel Shockley Obenshain
Soil Scientist, Bureau of Plant Industry,
Soils, and Agricultural Engineering
Agricultural Research Administration
Department of Agriculture

Mr. James Thorp
Soil Scientist, Bureau of Plant Industry,
Soils, and Agricultural Engineering
Agricultural Research Administration
Department of Agriculture

In addition, a great many other United States soil scientists attended the conferences and took part in the discussions.

Organization of the Congress. The Congress was organized and directed by a Dutch Organizing Committee with Prof. Dr. C. H. Edelman as Chairman and President of the Congress. The Committee had selected outstanding individuals from various countries to serve as officers of the several sections and to present the invitation papers for the general meeting. These officers and committees are set forth in the attached program.

The Dutch

The Dutch Organizing Committee asked the so-called Temporary Advisory Committee, established in Paris in 1947, to take responsibility for handling the business sessions. The head of the United States Delegation acted as chairman of these sessions. The Dutch Organizing Committee furnished secretaries for all of the meetings, including the business meetings, and have taken the responsibility for publication of the final proceedings and agreements.

In addition to the Congress itself, the Dutch Organizing Committee provided members with an exceedingly interesting and helpful series of demonstrations organized as a field trip lasting about two weeks in Holland and about one week in Belgium. The details of the Belgian excursion were, of course, handled by a special committee of Belgian soil scientists. This gave members of the Congress an excellent opportunity to see the actual soils in the field and follow the methods of investigation and application used so successfully by the Dutch in their reclamation and advisory programs.

Work of the Committees.

(A) Scientific and technical.--The Congress dealt almost exclusively with scientific questions. Scientific papers were presented and discussed. Definite conclusions and resolutions are rarely possible or appropriate in such matters. No recommendations or resolutions were made to governments beyond the usual vote of thanks to the Government of The Netherlands and the City Council of Amsterdam.

The program of scientific papers (attached) and the discussions emphasized the need for more frequent general meetings of this sort. (The last Congress was held 15 years ago in Britain.) As soil science develops,
more

more and more general principles are needed -- principles that fit experiences from the field, from the experimental plot, and from the laboratory -- and many apparent conflicts need to be resolved.

Previous congresses of soil science have been organized along the lines of the 6 main phases of the subject: (1) soil physics, (2) soil chemistry, (3) soil biology, (4) soil fertility and plant nutrition, (5) soil classification, cartography, and geography, and (6) soil technology. In this Fourth Congress, however, only the first 4 of these groups of specialists had sectional meetings as such. Then there were 5 additional groups of sectional meetings which provided for subjects of immediate interest that concerned scientists from two or more of the old classical sections. These were (1) soil conservation (erosion control, mainly), (2) saline soils, (3) clay minerals, (4) tropical and subtropical soils, and (5) land classification. Interest in each of these five subjects has increased since the Third Congress and our European colleagues were especially anxious to discuss them, partly because of the large amount of new work done in the United States. Yet it turned out that this kind of organization was not completely satisfactory; and nearly everyone agreed that it is better to have sectional meetings of the 6 basic branches with a few symposia on topics of immediate special interest. Work will always continue in the 6 basic branches of the subject, while the special topics will be changing from time to time. At the Fourth Congress, the specialists in soil classification, for example, were necessarily divided between tropical and subtropical soils on the one hand and land classification on the other, and they had too few opportunities to meet together as a group. This made attendance especially difficult

for

for the many soil scientists deeply concerned with land classification in the Tropics.

The program on clay minerals was especially well attended by an enthusiastic group of young research workers. Besides the scheduled program, they had several evening symposia. This research is still mainly in a "fundamental" or theoretical stage, but important techniques and principles are emerging that will make our knowledge of soil behavior and our techniques for soil classification more precise. The minerals in the clay fraction are of the greatest importance. Recent advances in physics have made their study possible. Differences among soils in their reaction to fertilizer, in their responses to drainage and irrigation, in their erodibility, and in other practical qualities, depend upon the mineralogy of the clays. Some of these minerals in clays occur only in microscopic or submicroscopic crystals, and thus must be studied by indirect methods.

Interest is growing very rapidly in tropical soils, partly because of the emphasis given to agricultural development in Africa by the Colonial Ministries of France, Belgium, and the United Kingdom, and partly by the interest of the United States in helping the countries of Latin America^{3/} to develop their agricultural resources. Tropical soils are so unlike those of temperate regions that very few farming techniques can be

^{3/} Actually, however, very few from Latin America attended the Congress. This may have been partly a matter of expense, but was probably due more to the exceedingly small number of soil scientists in Latin America and to the apathy of some of the governments toward scientific research.

transferred directly from the United States and Western Europe to the Tropics. But the transfer of fundamental knowledge and techniques at the level of research laboratories and field studies can be made.^{4/} Then too, the economic and social conditions existing in the Tropics require the formulation of special techniques. In some villages, for example, agricultural advisers must start with improved hand tools; and progress beyond them is often directly to a simple tractor, without the intermediate stage of animal power.

Orderly development in the Tropics, it was generally agreed, will follow research and invention within the Tropics itself. Considering the qualifications of scientists in the various countries, it may well be, for example, that tropical Latin America may be helped more by the techniques that can be transferred from the research institutes in Africa, as they develop, than by attempts to transport techniques from the United States to Latin America directly.

Soil fertility and plant nutrition received great emphasis at the Congress, and many significant papers were given. This field too is rapidly getting onto a far better footing. Soil scientists are especially concerned with developing methods for determining fertilizer requirements to guide advisory programs with farmers. Perhaps no other opportunity exceeds this one for increasing the total food supply in the world and especially the supplies of the "protective" foods. A great deal of

^{4/} It may be relevant to add that the discussions at the Fourth Congress brought out these points and that, so far as the Delegation can determine, the planned program of technical assistance in soil science under ECA in Africa is consistent with the best opinion of qualified soil scientists.

progress has been made in our country and in several other countries along four principal lines: (1) the development of rapid chemical methods for determining fertilizer needs^{5/}, (2) assessing nutrient needs through the appearance of the leaves of the plants, (3) the development of rapid methods for leaf analysis, and (4) great improvements in field plot technique, including short-time plots.

Interest in this field is so great and the results so important that most members of the Congress felt that it deserves a special meeting before the next full congress. Those interested in agricultural development, both settlement and improvement of existing agriculture, see in this field great opportunities for soil scientists to expand the usefulness of advisory work enormously.

Those phases of soil physics and soil chemistry that relate to water movement in soils were discussed a great deal, especially informally during the excursions. A large amount of soil exists in the world that is potentially irrigable if water supplies were developed for the purpose. As important, and perhaps even more important, are the large areas of irrigated soils that are now declining in productivity due to the accumulation of salts, water-logging, or loss of structure. These problems are acute in parts of the United States and especially so in the Near East, including Egypt, and in southern Asia. The results obtained during the past few years at the United States Regional Salinity Laboratory in Riverside, California, were especially interesting to scientists from areas having these problems.

^{5/} These must be standardized against field experience and shall need to be done in the laboratory for the most part, not with field kits.

Some of the major problems of soil conservation were discussed in both specific and general terms. Generally it may be said that the earlier more or less emotional approach is now giving way to more serious and scientific study. As an interesting detail, the successful fertilization of eroding pasture lands by aircraft was reported. The results indicated great recovery of grass cover with increased production and decreased soil erosion.

Special attention was given to the problem of shifting cultivation in the Tropics. Several papers pointed out the near impossibility of stopping the process and that the solution of the problems resulting from certain forms of shifting cultivation lies along the lines of improving the methods. Favorable experience was reported from both Indonesia and Africa below the Sahara.

In a way it may be a bit unfair to single out these obviously important subjects for highlighting, since many other important ones were discussed and demonstrated. Certainly every United States delegate was enormously impressed with the success that Dutch engineers and soil scientists have had with reclamation schemes in Holland. If all of the soil in the world with at least as good potentialities as those in Holland were reclaimed and managed with similar efficiency, world food production would be truly astronomical. What they have done in the Rhine Delta with a lot of water and a lot of work and a little soil material is amazing. It suggests that we in this country could, if economic and social conditions demanded it, increase our food production far beyond any estimate that has ever been put forward.

(B) Organizational

(B) Organizational.--The constitution of the International Society was redrafted during discussion and debate in the business sessions. The old constitution provided essentially that the Society should be one devoted to the fostering of all branches of soil science through the sponsoring of congresses and conferences and through the publication of scientific abstracts and journals. It provided that the principal officers should be from the host country of the next Congress. It provided for individual membership with members paying subscriptions that included the cost of regular journals and other reports. Proceedings of congresses and of part of the conferences (either regional or sectional by subject) were included with the fees for such congresses and conferences. In practice, these publications were often partly subsidized by one or more sources of institutional funds.

The principal weakness of the old constitution lay in its complete emphasis on individual membership. This was brought out during the last war. Since it had been planned in 1935 to hold the next Congress in Germany in 1940, the president of the Society and most of the section officers were German. Individuals were helpless to reorganize the Society and the responsibility to do so was taken logically by interested National societies.

The revised rules are somewhat different from the old ones.

First of all, it did not seem wise to continue publication of scientific journals. Well-edited and well-managed journals are now printed that care for the field quite adequately. It was felt that soil scientists should support these journals and not divide their support, with the possible result of weakening the present ones and not getting a very strong one as a substitute. The Commonwealth Bureau of Soil Science in Britain, for example, is

now

now publishing an excellent abstract journal that could hardly be improved. The bibliography prepared by the Library of the United States Department of Agriculture treats soil work adequately. There are several journals in this country and other countries that publish worthy original articles in soil science. Thus, the new rules provide only for the publication of a bulletin devoted to membership lists and news items about important discoveries, new research institutes and expeditions, and things of that sort. The aim will be to keep every member as well informed as possible about who is working on problems similar to those that engage his attention.

Although the new rules provide that the President and Vice-President of the Society shall be elected from the host country for the next congress, 4 officers for each commission shall be elected without regard to national status. The host country will select a vice-president and a secretary for each commission in addition. The new rules also provide for a Council that has one representative of each national or regional society and 7 representatives of personal members, unattached to a national section, who are to be elected during each congress.

The rules were approved during debate at the final sessions of the Congress. Obviously, certain last-minute suggestions could not be put in proper form and the Executive Committee was instructed to redraft the rules as needed for clarity to express the sense of the meeting and that these would be circulated to the members of the Council and finally approved at the Fifth International Congress when assembled. Admittedly, this may be somewhat loose procedure, but after all, the members of the Society are held together only by their interest in soil science and otherwise have few funds or other

or other responsibilities.

A decision was made to accept the invitation of the Belgian Government to hold the Fifth International Congress of Soil Science in the Belgian Congo in the summer of 1954.

Decisions were taken to advise the officers of the Society to consider the holding of a special conference on soil fertility in Ireland in 1952 or 1953 and the Sixth International Congress of Soil Science in France in 1956 or later.

After talking with United States officials in Europe, the United States Delegation decided that it would not be wise to invite the Congress to the United States in the near future, because the Delegation felt that too few of the young men in soil science in Europe would be able to find enough foreign exchange to make the journey.

Officers selected at the Amsterdam meeting include the following, to serve until the close of the next Congress:

President:	Prof. Dr. R. Tavernier (Belgium)
Past-president:	Prof. Dr. C. H. Edelman (Holland)
Vice-president:	Director-General F. Jurion (Belgium)
Secretary-Treasurer:	Dr. W. R. Domingo, Bedrijfslaboratorium Voor Grondonderzoek, Oosterbeek (Holland)

Commission I (Soil Physics)

Chairman:	S. Henin (France)
Past-chairman:	J. Gustafsson (Sweden)
Vice-chairman:	L. A. Richards (U.S.A.) R. K. Scofield (U.K.)

Commission II (Soil Chemistry)

Chairman:	H. Deuel (Switzerland)
Past-chairman:	S. Tovborg Jensen (Denmark)
Vice-chairman:	J. Lavollay (France) I. N. Mukherjee (India)

Commission III

Commission III (Soil Biology)

Chairman: H. G. Thornton (U.K.)
Past-chairman: A. G. Norman (U.S.A.)
Vice-chairman: J. Pochon (France)
F. C. Gerretsen (Netherlands)

Commission IV (Soil Fertility and Plant Nutrition)

Chairman: F. Steenbjerg (Denmark)
Past-chairman: E. M. Crowther (U.K.)
Vice-chairman: T. Walsh (Eire)
R. Q. Parks (USA)

Commission V (Soil Genesis and Classification)

Chairman: James Thorp (U.S.A.)
Past-chairman: H. Greene (U.K.)
Vice-chairman: G. Aubert (France)
C. G. Stevens (Australia)

Commission VI (Soil Technology)

Chairman: R. D. Hockensmith (U.S.A.)
Past-chairman: J. P. Harroy (Belgium)
Vice-chairman: J. V. Bothelo da Costa (Portugal)
Putod (France)

Conclusions: Speaking generally, the Congress was a great success.

Most of the papers reflected a high standard of scholarship and a few were exceedingly good. All things considered, the Congress was very well attended. About 300 took part in the excursions in Holland and about 100 took part in the excursions in Belgium. Perhaps the greatest value of meetings of this kind is the opportunity for scientists with common interests and problems to become well enough acquainted personally to carry on effective informal collaboration and to exchange views. Simply hundreds of such individual conferences took place where men agreed to exchange papers, visit one another's research institutes, arrange for graduate study, and so on. Certainly the European soil scientists were extremely pleased to have this opportunity to discuss their work with the Americans, especially since so

many

many of the scientists lack the facilities for travel to the United States. Certainly the American soil scientists have a much clearer picture of both problems and opportunities facing their opposite numbers in other countries.

Since the Congress is wholly a technical Congress, and since the International Society of Soil Science is wholly a private organization, no resolutions, recommendations, or actions of direct concern to governments were dealt with.

The Delegation should like to emphasize the importance of attendance by leading United States soil scientists at the Fifth Congress planned for Leopoldville, Belgian Congo, in 1954. Several were chosen as officers in the individual sections. This will be the first full congress in a tropical area. Through technical assistance programs many of our soil scientists are asked to assist in the development of research and advisory programs in tropical countries. Many students and responsible scientists from these countries come to the United States for study. The Fifth Congress will give the best possible opportunity for appraisal of results and future needs in a general program of great interest to the United States.

November, 1950
Washington, D. C.

The motion is made to establish a nomenclature committee in relation to those of national sections.

It is arranged to have a special committee, not commission, on saline soils. It is agreed not to form any other commissions or subcommissions at this time beyond the six basic ones provided for in the draft rules.

The report of the nominating committee is read and accepted. A list of the individuals chosen is attached. Further reports of the Congress are contained in Vol. III of the Transactions and in the attached report of the United States Delegation to the State Department.

After the business sessions, the Congress goes into a final closing session and is officially over. Mrs. Kellogg and I have dinner with Mr. and Mrs. Bramao, Henin, and Aubert. We then go down to the Hotel Krasnapolsky for the final social evening of the Congress.

August 2

This morning we pack for the post-Congress excursion in Holland. A telephone call from the ECA office in Paris nearly causes me to miss our bus. There is considerable confusion in getting started. We finally leave about 1:30.

We go north of Amsterdam and over the big dike between the sea and Uselmeer. We stop for tea at a little place near the center of the main dike and then drive on to Groningen. We have our room and meals at the Willems Hotel.



K-1869 August 2, 1950
Holland. View of main damming dike,
North Sea side.



K-1870 August 2, 1950
Holland. View of main damming dike,
North Sea side. Close view of basaltic
riprap.

August 3

We are up very early this morning and get started at 7:00 a.m. in order to look at the land reclamation in a new polder while the tide is out. The description of the tour is on pages 27 - 35 of the Guide Book.^{1/}

We are shown how ditches are made with little dams of brush and with piles in order to reduce the wave action when the tide is in and in order to catch the silt brought in by the tide. As the little ditches are filled with silt, the material is cleaned out and thrown up between them. In this way, the land is raised 4 to 5 inches annually. Later, vegetation covers the new tidal land. Marine animals also help the process by aggregating fine particles of clay and silt that sink into the water. I walk out into the tidal flat as far as possible and get some pictures. It is said that this work costs around 4 to 5 thousand guilders per acre. The processes involved are explained by Dr. J. van de Ham, biologist, and by Dr. L. F. Kamps, specialist in soil reclamation.

We drive on and look at a profile in the Westpolder that is said to be characteristic of the reclaimed soil. An analysis is given at the top of page 33 of the Guide. Locally this is called "clay soil," but we should not regard it so. The surface A_p

^{1/} Since the Guide Book is quite complete, the notes on the field trips are limited largely to additional direct observations and do not repeat the material already covered adequately in the prepared Guide Book. (Appendix volume.)



K-1871 August 3, 1950
Holland. Northeast of Groningen. From
the sea dike looking toward new land re-
clamation. Salt-tolerant plants.



K-1872 August 3, 1950
Holland. Northeast of Groningen. Ditches
for reclamation.



K-1873 August 3, 1950
Holland. Northeast of Groningen. Beginning of reclamation of tidal lands with ditches and baffles. Tide now out. (This is an earlier stage than the previous photograph.)



K-2028 August 3, 1950
North Holland. Northeast of Groningen.
Reclamation of tidal lands with ditches
and baffles. Tide out.

P-LXIII



K-2029 August 3, 1950
North Holland. Northeast of Groningen. Beginning
of reclamation of tidal lands with ditches and baffles.
Early stage of previous view.

horizon is about 10 inches thick and consists of a dark gray (10YR 4/2) silty very fine sandy loam. Beneath is medium to light gray silty very fine sandy loam, containing somewhat less clay than the surface soil. The soil is prominently, but finely, mottled and streaked with dark reddish-brown. The stains of roots are prominent down to the water table, which now stands at 34 inches.

✓ I get a good kodachrome view of this soil and take some pictures of farms and crops, including dry peas with rape seed in the background.

We drive by a pumping station operated by electric power and then on to a heavier soil that has bad structure unless used for grass. The analysis is shown in table 3 on page 34 of the Guide.

This soil has a dark grayish-brown clay loam surface layer about 14 inches thick, with mottled brown and gray clay to the water table at 28 inches. Normally the water table is higher; it was pumped out recently for this demonstration. There is a small band of dark-colored, organic-rich soil just below 14 inches. Perhaps this soil could be called a young Humic-Gley.

It rains.

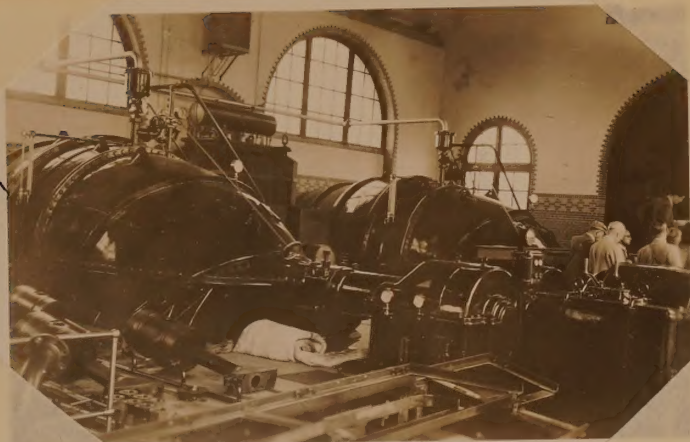
After lunch in Groningen, we take a look at the soil testing laboratory and experiments with manures and fertilizers. We have just a few minutes at each of a great many demonstrations.



K-1874 August 3, 1950
Holland. Farm in Northwest Polder.



K-1875 August 3, 1950
Holland. Farm in Northwest Polder.
Harvested dry peas cocked. Rape
seed in background.



K-1876 August 3, 1950
Holland. Pumping station, "De Waterwalf."



K-1877 August 3, 1950
Holland. Between Ezinge and Groningen.
Pasture on the heavy clay (Knik).

As one delegate put it: "After I have been through this demonstration, I know exactly how a soil sample feels going through the laboratory."

It rains nearly all the afternoon. After an early dinner and a little chit-chat, I go to bed.

for Aug. 3 of Journal

2797.

Group I, sub-group C

AGRICULTURAL EXPERIMENT STATION AND INSTITUTE FOR SOIL RESEARCH T.N.O.

SOIL TESTING LABORATORY

GRONINGEN.

Ic

Visit of the excursion of the Fourth International Congress of Soil Science on Thursday, August 3, 1950.

During the lunch the visitors will be divided into two groups I and II. Both groups will on its turn be divided into three sub-groups A, B and C.

Time-table for group I.

- 14.00 - 14.05 Arrival at 3 Van Hallstraat, Agricultural Experiment Station and Soil Testing Laboratory. - Sub-group B will be divided in half. Sub-group A + 1/2 B are first going to the Experiment Station (a), sub-group 1/2 B + C to the Soil Testing Laboratory (b).
- 14.05 - 15.25 Demonstrations according to the following scheme.

		Sub-group			
		A + 1/2 B		1/2 B + C	
14.05 - 14.45		a		b	
14.45 - 15.25		b		a	

For the names of the scientific workers and for the topics, which will be discussed at the places a and b, may be referred to the adhering "SUMMARY".

- 15.25 - 15.35 By motor-bus to 122 Verlengde Oosterweg
- 15.35 - 15.40 Arrival at the building 122 Verlengde Oosterweg, the former Institute for Soil Research. Formation of the sub-groups A, B and C, which are going to the places 1, 2, 3 and 4 (see the scheme).
- 15.40 - 17.00 Demonstrations according to the following scheme:

		Sub-group		
		A	B	C
15.40 - 16.00		1	3	2
16.00 - 16.20		2	4	1
16.20 - 16.40		4	2	3
16.40 - 17.00		3	1	4

For the names of the scientific workers and for the topics, which will be discussed at the places 1, 2, 3 and 4, may be referred to the adhering "SUMMARY".

- 17.00 Departure to the hotels.

SUMMARY of the topics which will be discussed by investigators of the Agricultural Experiment Station and Institute for Soil Research T.N.O. as well as of the Soil Testing Laboratory during the visit of members of the Fourth International Congress for Soil Science to Groningen, August 1950.

The short time available makes it impossible even to give a brief impression of all the work done by the Institutes mentioned above. Things that will be shown, are to be considered as a few illustrations to the description occurring in the booklet "Soil Science in the Netherlands, Indonesia and Suriname", which has been handed over to all members of the Congress.

The scientific workers, who will give explanations, owing to the limited time, will have hardly any opportunity to answer questions more in detail.

3 Van Hallstraat.

a. Agricultural Experiment Station.

Agricultural demonstrations.

1. Some investigations in progress.

Ir. J. Kortleven, agronomist. - Investigations with town refuse and with different kinds of compost, obtained from town refuse, as sources of organic matter in the soil. In the second year after its application ground town refuse shows a favourable and important after-effect because of the nitrogen-fixation in the former year.

Drs. P. Bruin, General director and chemist, will show the design and some results of a lysimeter experiment which is going on in the garden of the station since 1918.

Dr. Ir. H.W. van der Marel, chemist-mineralogist. - Mineralogical weathering of potassium and magnesium compounds in sandy soils of different petrological provinces, elucidated by pot experiments with oats.

2. Demonstration of field work.

The Agricultural Experimental Station at Groningen has an extensive staff to its disposal for doing the technical work on the experimental fields of the Station on private farms.

Approximately 300 experimental fields including about 12000 plots and occupying a total area of 55 ha were laid out by the Station over the whole country this year.

Dr. F. van der Paauw, Head agriculturist will give a demonstration of the field work on the experimental fields by the technical staff and of the work done on the harvested products.

1) Mowing and weighing grass and clover by the technical staff for determining the yield. Demonstration of the tools used.

2) Visual valuation of the soil structure.

- 3) Laying out and marking off the experimental fields.
Demonstration of tools.
- 4) Sampling the soil by means of borers.
- 5) Exhibition of some implements.
- 6) Treatise of potato samples for determining the under water weight of tubers and for chemical analysis.
- 7) Determinations in potato pulp in the laboratory.

b. Soil Testing Laboratory.

Routine analysis of soil samples of practical farmers and of experimental fields; total capacity at Groningen and at three branch laboratories in other places more than 7500 single determinations daily; at the four laboratories more than 125000 soil samples are investigated annually; determinations of pH, lime condition, organic matter, granulometric analysis, phosphate, potash, magnesia, chlorine and copper.

122 Verlengde Oosterweg.

1. Meeting room.

Dr P.K. Peerlkamp, physicist.

A few words about the work on soil structure.

Some results: a) Soil structure and the yield of potatoes on clay soils, b) soil structure and wind erosion on reclaimed peat soils, c) the pH-influencing the structure of reclaimed peat soils, d) soil structure of grassland on a sandy soil and on a sandy clay soil rich in humus after manuring with stable dung during a 50-years-period as compared with the use of fertilizers only.

Ir. J.A. van der Loeff, agronomist and librarian. - Demonstration of some important papers of the Institute, published during the 60 years of its existence (only if sufficient time is available).

2. Weighing room.

Dr. Ir. F.C. Gerretsen, microbiologist. - Determination of copper, magnesium and zinc by means of the mould *Aspergillus niger*. - In the case of copper the colour of the spores is a measure for the quantity of this element in the soil. In the case of magnesium and zinc the weight of the mycelium is closely related to the quantity of these elements in the soil or in plant material. - Automatic watering of sterile cultures of higher plants (sunflower). The installation is designed to keep the water content of the soil in the culture pots at a constant level. Especially for sterile cultures this is a great advantage, the ordinary regular watering being a constant menace of sterility.

Dr. Ir. E.G. Mulder, agronomist. - Influence of molybdenum on nitrogen fixation by clover growing in acid soil.

3. Room 12.

Dr. S.B. Hooghoudt, chemist-hydrologist and
Drs. L.F. Ernst, physicist. - Models of water movement towards drain pipes and to a canal. - Some remarks on irreversibly desiccated peat soils.

4. Greenhouse.

Dr M.A.J. Goedewaagen and dr. J.J. Schuurman, botanists.
- Technique and some results of root investigation on grassland and on arable land.

Dr. J.Th.L.B. Rameau, chemist. - Magnesium deficiency of potatoes depending on the pH and magnesium content of the soil (only if sufficient time is available).

BEDRIJFSLABORATORIUM VOOR GRONDONDERZOEK, GRONINGEN

Datum

Grondmonsters van

Bij inzending via Voorl. dienst
of Bedr.-ver. hier naam van
assistent invullen

Analyserapport zenden aan

Rekening zenden aan

Maximaal kan één afschrift worden verstrekt.

Indien gewenst zenden aan

te

gemeente

te

NIET BESCHRIJVEN

te

te

te

[illegible]

bw = bouwland
gr = grasland
ggr = gescheurd grasland (jaartal)
ks = kasgrond
kw = kunstweide
bg = boomgaard
tg = tuingrond

2) Grondsoort
 Hiervoor kan men invullen:
 zandgrond
 esgrond
 heideontginning (ouderdom)
 dalgrond (ouderdom)
 rivierklei
 zeeklei
 venige klei
 kleihoudende veengrond
 indrogende veengrond
 akkergrond
 beemdgrond
 roodoorn
 hoogveen
 löss

3) Voor gewenst onderzoek kan ingevuld worden:

Gewoon onderzoek (waaronder verstaan wordt: pH, humus
zodig koolzure kalk en bij kleigronden
ook granulaire samenstelling)

Fosfaatonderzoek

Kali-onderzoek

Wenst men alle bovengenoemde drie onderzoekingen, dan invullen:
Volledig.

Voor kasgronden is het gewenst ook te vragen: Zoutonderzoek.

Niet beschrijven

Rlbc
Rtbc
Geen

Aanvr.: 0-5
5-20
20-40
0-20

5-20
20-40
0-20

August 4

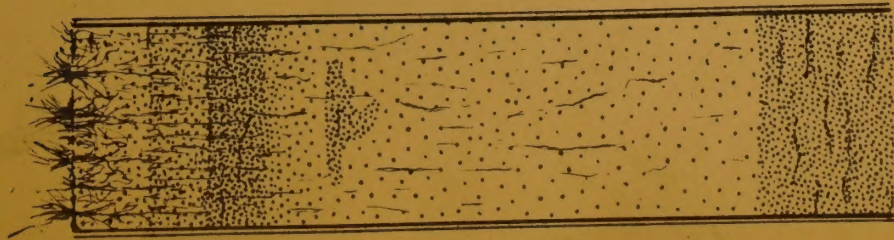
Today we take the excursion in the reclaimed peat district (pages 36 - 51 of the Guide).

First we pay a short visit to the experimental farm at Borgercompagnie. We have an opportunity to look at only a small part of a large layout of experimental plots. We are shown one of these in some detail that deals with the responses of potatoes to potash at different rates of liming, sulphur use, magnesium, and farm manure applications, with two varieties. There is a big effect of manure on these sandy soils said to be due to magnesium. The best results were had with both magnesium and farm manure. It is said here that for potatoes there should be 150 p.p.m. of magnesium in the HCl extract. Potato blight is worse where magnesium is deficient.

We are told that all the plots are given 200 kilograms of K_2O per hectare, 80 kilograms of P_2O_5 , and 170 kilograms of N. Rye and oats get somewhat less -- 120, 80, and 100, respectively.

On another experiment with potatoes, they have the best results from nitrogen when manure and chemical fertilizer are used together. They get increased yields from the manure up to 20 tons per hectare besides a full application of N, P, and K. Even 40 tons of manure alone does not give maximum yields. One speaker suggests 150 kilograms per hectare of N as best, whereas another says 170.

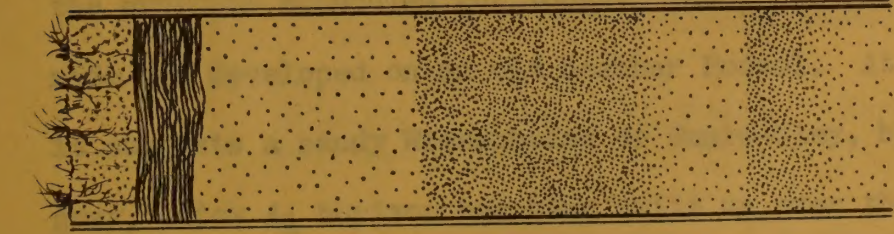
PROFILES OF THE RECLAIMED PEAT SOILS



without peat



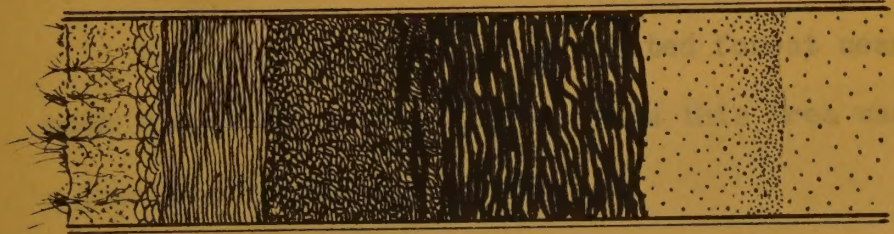
sand



with a thin
bad peat layer



spongy peat



with a thick
bad peat layer



stratified peat



re-reclaimed
(thin peat layer)



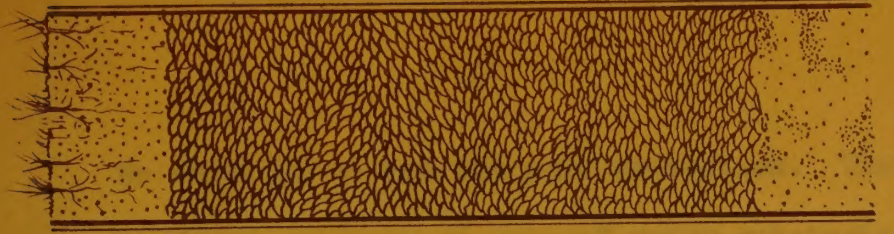
decomposed peat



re-reclaimed
(thick peat layer)



gyttja



ideally reclaimed
peat soil.

We drive on to see the peat excavation. The upper layers are saved and put back on exposed sandy substrata. Some of the old stumps are said to have been buried in the peat about 5000 years ago.

Near the excavation is a deep ditch or canal dug into the sand. This excavated sand is then spread over the old lower soil, the original surface soil is replaced, and the whole is mixed to form the new surface soil. (It rains.)

We drive on to lunch at Emmen, where we are served by a group of women in their native costumes.

As we start out after lunch, we stop at a very old burying ground -- Hunnebed. From the tops of the small mounds are the remains of the crude structures made from huge granite stones crudely shaped to form sides and a flat top.

The sandy soil under the planted forest nearby is a young, weak Podzol, likely developed since this area was set aside as a forested recreational area.

Because of some delays, we need to hurry in order to examine the profiles scheduled for today. The first profile is a man-made one developed on an old heather Podzol. At first glance, it suggests a sandy Wiesenboden or Humic-Gley, but the very dark gray, thick A_1 horizon has been built up over the ages through the long-continued use of compost made from manure and sandy



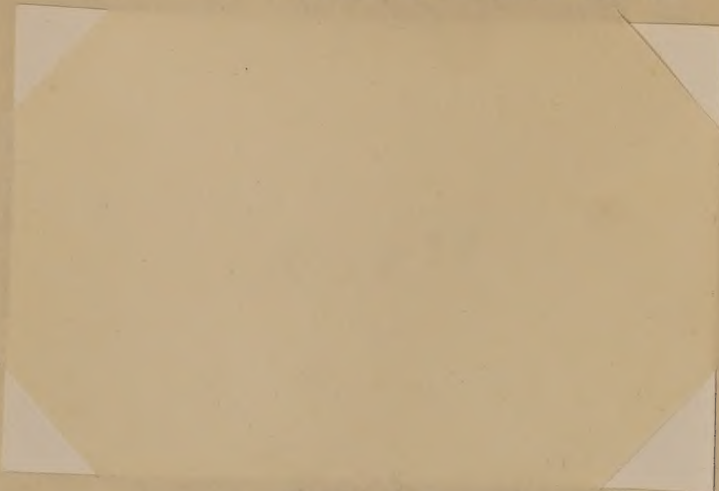
K-1878 August 4, 1950
Holland. Southeast of Groningen. Part
of the experimental plots at Borgercompagnie
on the reclaimed peat.



K-1879 August 4, 1950
Holland. Northeast of Emmen. Excavated
peat piled to dry.



K-1878 August 1, 1930
Holland, Southeast of Groningen, Fort
of the experimental plots at Hagerman
on the reclaimed peat.



K-1879 August 1, 1930
Holland, Northwest of Emsen, Excavated
peat piled to dry.



K-1880 August 4, 1950
Holland. Northeast of Emmen. Dr. Bradfield
looks at freshly exposed cut of peat. Note
the old trunks.



K-1881 August 4, 1950
Holland. Northeast of Emmen. Peat excavation.
Wall at left; old stumps in center; and drying
peat to extreme right. The stumps are said to
be 500 years old.



K-2030 August 4, 1950
Holland. Emmen. Ladies in native costume who
serve our lunch.

heather sod. If the A_1 were due to natural poor drainage, the lower soil, at least, would be gleyed or at least show evidence of fossil gley. Instead, it is a bright yellowish-brown.

I am able to get some good kodachromes, but have no time for a proper description.

- | | | |
|-----|----------|--|
| (1) | 0-16" | Nearly black loamy sand (7.5YR 2/0). |
| (2) | 16-24" | Medium gray loamy fine sand. |
| (3) | 24-30" | Dark brown loamy fine sand (7.5YR 3/2). |
| (4) | 30-48" + | Yellowish-brown sand (10YR 5/8) mixed with sandy till at about 6 feet. |

The land is nearly level. In the general area are rolling old fixed dunes with heather Podzol that are not used for farming because of droughtiness. It is probably from those sites that ancient farmers took the heather sod for use in compost. It is amazing what a good soil has been made by this old practice from a heather Podzol.^{1/}

We walk some distance to see a so-called "river channel soil." This is very dark brown to black in the upper part, with dark reddish-brown fine sandy loam from about 6 inches to 20 inches. At 20 inches there is a nearly black horizontal streak about 1 to 2 inches thick. This is underlain by gray silty fine sand. The soil supports good grass and is said to make fairly good arable land when drained.

^{1/} It is thought by some that many of the heather Podzols themselves followed deforestation by early man and heavy sheep grazing. This brought in the heather and the Podzol.

heather sod. If the $\frac{1}{2}$ were due to natural poor drainage, the lower soil, at least, would be gleyed or at least show evidence of fossil clay. Instead, it is a bright yellowish-brown. I am able to get some good Kodachromes, but have no time

for a proper description.

(1)	0-16"	Nearly black loamy sand (7.5YR 2/0).
(2)	16-24"	Medium gray loamy fine sand.
(3)	24-30"	Dark brown loamy fine sand (7.5YR 2/2).
(4)	30-48" +	Yellowish-brown sand (10YR 5/8) mixed with sandy till at about 6 feet.

The land is nearly level. In the general area are rolling old fixed dunes with heather Podzol that are not used for farming because of droughtiness. It is probably from those sites that ancient farmers took the heather sod for use in compost. It is amazing what a good soil has been made by this old practice from a heather Podzol.

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It is thought by some that many of the heather Podzols themselves followed deterioration by early man and heavy sheep grazing. This brought in the heather and the Podzol.



K-2031 August 4, 1950
 Holland. W. (?) of Emmen. Profile of old arable
 land, originally heather Podzol with greatly thickened
 dark surface horizon by long manuring with a mixture
 of dung and heather sod. The soil is developed from
 mixed sandy till. The surface now suggests Wiesenboden,
 but there is too little mottling.

Afternoon excursion Drente. Description soil profiles at Zweelo.

Description of the profiles.

1. Undisturbed old arable land.

The humus content declines gradually in the deeper layers, which is noticeable by their colour. The drab layer is difficult to distinguish. Agriculturally it is of importance as originally also oak leaves were mixed with the manure applied on the land, in distinction with later periods, when only heather sods were used for litter.

The soil is extremely suitable for growing arable crops, provided the humous layer is deeper than 60 cm.

The humous layer derives its significance not only from its high content of nutrients, more particularly from its ability to retain large quantities of water. Due to this the crops do not suffer from drought, though the watertable is not within the reach of the roots.

The principal crop grown here is rye and the soil is also suitable for potatoes and beet. Some more particulars of the soil profile are being indicated.

The U-figure is an index of the fineness of the sand. When $U = 100$, the average diameter of the sand-particles is 0,01 cm.

2. River-channel soil.

We are now at a level ± 2 m lower. The soil has become boggy. The silt content in the top soil varies considerable but is usually not high. The sand in the subsoil is stratified. Coarse and fine sand strata interchange.

This soil is too wet for arable land and even for grassland, the watertable is on the high side. The soil is not acid, but is deficient in phosphates.

With deeper drainage and proper manurial treatment, this soil can be turned into intermediate quality arable land.

3. Transition-moor.

Down to approximately 1 m depth marshpeat is to be found here. The underlying sand consists again of alternate thin strata of coarse and fine particles.

The peat is partly decayed and contains residues of
sedge (Carex) myrtle (Myricaceae)
grey-hairgrass (Weingaartneria) Rhynchospora
birch (Betula)

The birchtwigs can still be easily traced. Iron deposits occur in the old root tracks. The peat is not acid, but very deficient in phosphates. The phosphates have been locked up in insoluble iron compounds.

Much care has to be taken in draining this peat as it inheres the inconvenient property of irreversible desiccation (i.e. once it is desiccated it is very difficult to wet again).

This soil is suitable for grassfarming, if it is properly tended and manured but not deeply drained.



K-1882 August 4, 1950
Holland. W.(?) of Emmen. Small grain, chiefly
oats, on sandy soil with deep A, thickened by
centuries of manuring with heather sod and
manure compost.

We are then shown an organic soil with about 30 to 40 inches of dark brown peaty muck over gray sand. The old root channels are plain. In the lower part of the organic solum is some segregation of iron. This peat is said to dry nearly irreversibly. It produces good grass if the water table is kept controlled at a level very near the surface.

We then drive on to see a heather Podzol (or humus Podzol under heather) in fine sand. The surface is billowy and the whole area is a low ridge. I get some good kodachromes.

The surface is somewhat disturbed. Broadly, the profile may be described as follows:

A ₂	0-10"	Medium gray fine sand, with some horizontal streaking.
B ₂	10-18"	(With tongues to 24 inches) Dark brown to nearly black sandy ortstein.
C	18-48"+	Pale yellow fine sand, with coarsely and roughly hexagonal fine streaking with pale brown.

We drive on to Zwolle through some interesting peasant villages where nearly all the people wear distinctive clothing. Many of the houses are painted with combinations of blue and green. The people are very camera-shy.

We arrive at our hotel in Zwolle at 6:30.

We are then shown an organic soil with about 30 to 40 inches of dark brown peaty muck over gray sand. The old roof channels are plain. In the lower part of the organic column is some segregation of iron. This peat is said to dry nearly irreversibly. It produces good grass if the water table is kept controlled at a level very near the surface.

We then drive on to see a heather bog (or humus bog) under heather) in fine sand. The surface is billowy and the whole area is a low ridge. I got some good Kodachromes.

The surface is somewhat disturbed. Broadly, the profile may be described as follows:

A ₂	0-10"	Medium gray fine sand, with some horizontal streaking.
B ₂	10-18"	(With tongues to 24 inches) Dark brown to nearly black sandy or tattered.
C	18-40"+	Pale yellow fine sand, with coarsely and irregularly hexagonal fine streaking with pale brown.

We drive on to Zwolle through some interesting peasant villages where nearly all the people wear distinctive clothing. Many of the houses are painted with combinations of blue and green. The people are very camera-shy.

We arrive at our hotel in Zwolle at 6:30.

P-LXXI



K-2032 August 4, 1950
Holland. Near Emmen. Slightly disturbed profile of
heather Podzol in fine sand.



8-2032 August 1, 1950
Holland, near Emmen. Slightly disturbed profile of
Heather Fodol in fine sand.

August 5

This morning we go out to the North Eastern Polder. Where we enter the area, the soil was made dry in 1942.

The reclamation work in such polders is now carried on by the State. This includes the construction of dikes, canals, pumping stations, roads, and houses. The State manages the land for one year and sometimes for as much as three years. During this period, the drainage systems are intensified. In this area, at least, the land remains in the hands of the State and is only leased to farmers. The importance of this arrangement is clear when one sees how farms have been split into small, uneconomic units through inheritance in so many parts of Europe.

We first stop to look at a sandy soil. This soil needs manuring and must be kept in grass, otherwise it is subject to blowing. Now, 5 or 6 heifers are grazed per hectare. Between 4 and 5 millimeters of water are required daily. The water table is controlled through a system of irrigation and drainage canals connected with tile drains that can work either for drainage or for sub-irrigation. Thus, one ditch along the parcel is kept dry and one kept wet.

I examine the layout of the tile; rather simple valves and weirs are used to control the water. Sphagnum peat is placed around the tile to seal the joints from fine sand. The tile are



K-1883 August 5, 1950
Holland. North Eastern Polder. Northwest of
Zwolle. Pastures on sandy soil newly developed.



K-1884 August 5, 1950
Holland. North Eastern Polder. General
view in newly settled area.

placed at 80 centimeters and can regulate water between 30 and 80 centimeters. In this sandy soil, tile lines are about 20 meters apart. In the clay soils here, I am told that tile is needed only for drainage, since the soil can hold enough water between rains that irrigation is unnecessary.

This year only 100 farms of 12 to 48 hectares were established out of 3000 applications. Farm families are carefully selected on the basis of industry, skill, and thrift. They need to have a thousand guilders per hectare, of which the family must own at least three-tenths itself. I am told that 2,000 guilders per hectare are required for normal buildings on a farm.

Settlement in the polders is being used to offer an opportunity to some of the excess people in areas where reallocation schemes are required to increase the size and compactness of holdings. The holdings that I see here on the clayey soils are all about 12 hectares.

I get a quick look at a new soil profile on the silty clay marine-alluvium. The soil is only 8 years old. Originally the material was bluish-black, like it is now in the lower part. This is called Profile No. 2 on page 62 of the Guide. I also get some nice kodachromes of the profile and of the field.

A _p	0-10"	Brown (10YR 4/1) silty clay loam; medium granular. Some reddish-brown mottling.
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B	10-20"	Brown (2.5YR 4/2) silty clay loam, slightly mottled and some vertical cracking.
B ₃	20-26"	Transitional
C	26" +	Nearly black (2.5YR 2/0) silty clay loam. Massive in place, but easily friable when removed. Probably rich in ferrous sulphide (not the "cat clay" of Edelman).

Throughout, there is some whitish mottling of lime-rich shells. In 1942, it is said that all the soil was like the present C. It seems hardly possible that there could be so much change in so short a time. The soil is relatively rich in phosphorus and potassium, but low in nitrogen. This field has an excellent stand of alfalfa, with the roots only about 20 to 26 inches deep. But the water table is reasonably well controlled at that depth.

We have especially good explanations today by W. H. van der Molen.

We drive through a new village including gardens and some forest areas for recreation. About six percent of the land, including the poorest soil, has been set aside for such forest-recreation areas.

In some of the new settlements, temporary housing has been used rather than the usual brick and cement. These are of wood and were prefabricated in Austria.

We pass the special experimental farm for the polder where some 50 hectares are used to test varieties, fertilizers, crop



K-2033 August 5, 1950
Holland. North Eastern Polder. Profile of young heavy soil developing from highly reduced silty clay loam. This soil already has developed structure and an excellent stand of alfalfa. The nearly black, massive clay comes at 26 inches. This soil has developed in 8 years.



K-2034 August 4, 1950
Holland. North Eastern Polder. Alfalfa on soil
developed from silty clay loam 8 years ago. The
roots are only about 18 to 20 inches deep, but the
water table is controlled.

rotations, and the like. We stop for coffee in one of the labor camps where the workmen stay who are developing the polder.

There are 26 such camps.

We look at another profile (No. 3, page 63 of the Guide) which consists of a clay loam over banded very fine sand that overlies mixed peat and sand, and finally sand at 6 to 8 feet. Along the edges of cracks, the peat is a bright reddish-brown.

We stop for a moment on another new farmstead with a prefabricated cement-concrete barn. Small trees have already been planted for windbreaks. The brick house cost about 20,000 guilders and the barn about 60,000. The crops include sugarbeets, flax, oats, and hay. There is a good garden.

We pass another farm operated by the National Farmers Union for plant breeding. Nearby are the central government repair shops and stores.

We then go to the main center for the polder, long planned in advance with the thought that the town will grow to a population of about 10,000. It is named Emmeloord.

I am told that most of the alfalfa here is grown on government land, partly because the land is easier to till with this crop, the soil lacks nitrogen, and the labor problem is more nearly manageable. Much of it is dried by charcoal. Yields are about 10 tons per hectare. Even so, the crop is considered too extensive for use by small farmers.



K-2035 August 5, 1950
Holland. North Eastern Polder. Profile of half-matured calcareous silt loam over stratified fine sand lying on peat, mixed with sand.



K-1885 August 5, 1950
Holland. North Eastern Polder. New
farmstead; note prefabricated concrete
barn.

Just before lunch here, we see an interesting film on the building of the dikes.

After lunch, we go to visit an old farm on the "Island of Kampen." The farm rests on one of the dwelling-mounds or terps. An explanation of how the city came to be on this land in the delta of the IJssel is given in the Guide Book (page 64).

In the barn, Mr. Visser explains a mechanical system of land classification. The system strikes me as a maze of errors. (I see now that this is the basis for part of Zuur's speech at the Congress.) Visser shows curves for each of several selected properties of soil in relation to yield. Then, he has a whole series of "single-value" maps that show arbitrary divisions of such selected properties or qualities, as depth to the water table, flocculation, clay content, silt content, phosphate content, potash content, and so on, but without reference to the various horizons or layers in the soil. Finally, he shows a "soil map" that someone has made by combining these others in a way that is not explained and Visser himself says he is not quite sure how it was drawn. It really is a nightmare.

We look at the Humic-Gley soil in the pasture (apparently the one on page 68 of the Guide). This soil is said to be influenced by the sea. The surface 6 to 8 inches is medium to dark gray clay loam, with mixed granular and small subangular blocky. Eight to 24 inches: gray silty clay loam with dark brown



K-1886 August 5, 1950
Holland. Island of Kampen. View of
old farmstead on a terp.



K-1887 August 5, 1950
Holland. Island of Kampen. General
view of farmstead on terp.



*Fourth International congress
of soil science
Amsterdam 1950*

*Excursion
hampshire*

The farm home that we visited.

mottling. The water table fluctuates through this G horizon. Twenty-four to 30 inches: gray and reddish-brown, streaked, wet sand. Below 30 inches is gray wet sand.

We are told to hurry, and I get only a quick look at a second profile (page 66 of the Guide). I should call this an intergrade between Alluvial and Humic-Gley. The surface is dark gray granular clay, with dark brown to very black wet clay, slightly mottled with reddish-brown, beneath.

A third profile (page 67 of the Guide) could be on a sandy terrace with clay layers beneath the grayish brown granular sandy loam surface soil. The soil becomes yellowish-brown and mottled below 12 inches.

We are urged to hurry. The pastures here look good, even on the last soil. The land is permanently in grass and used for hay and for rotational grazing.

We hurry back to the hotel, since some of the party must take an early evening train.

mottling. The water table fluctuates through this G horizon. Twenty-four to 30 inches: gray and reddish-brown, streaked, wet sand. Below 30 inches is gray wet sand. We are told to hurry, and I get only a quick look at a second profile (page 66 of the Guide). I should call this an intergrade between Alluvial and Humic-Gray. The surface is dark gray granular clay, with dark brown to very black wet clay, slightly mottled with reddish-brown, beneath. A third profile (page 67 of the Guide) could be on a sandy terrace with clay layers beneath the grayish brown granular sandy loam surface soil. The soil becomes yellowish-brown and mottled below 12 inches. We are urged to hurry. The pastures here look good, even on the last soil. The land is permanently in grass and used for hay and for rotational grazing. We hurry back to the hotel, since some of the party must take an early evening train.

August 6 (Sunday)

I spend the morning writing and in chit-chat with my fellow travelers. We are at the railway station at 2:30 and leave at 2:50 for Wageningen. I try for a few pictures along the railway, but I am afraid most of them will not be much good.

For quite a way we pass over undulating upland. Part of the soil is sandy and used for forest. Some of the cultivated fields suggest Gray-Brown Podzolic soil.

We reach Wageningen about 6:00 p.m. and go to Prof. Dr. Edelman's home, where we shall stay during our visit at this center. We have dinner and take a long walk to the top of the high cliff on the border of the flood plain of the Rhine.

Early to bed.

P-LXXVIII



K-1888 August 6, 1950
Holland. South of Zwolle. From the
train. Characteristic farmstead.

August 7

We go north of Wageningen to see the sandy soils of this district under the guidance of Prof. Dr. Edelman (page 79 of the Guide). He points out as we start that the high sandy soils are used for forest, those of medium elevation for arable land, and the lowlands for pasture. Edelman says that the true Podzols are all nearly pure sand, less than 4 percent colloids. He suggests the term "silicomorphic." This would be equivalent to the Dry Sands of our 1938 classification.

We first take a look at a humus Podzol under heather and a thin stand of pine (1a, page 79 of the Guide).

A ₁	0-2½"	Nearly black, humus-rich, loamy sand. Coherent when moist. The heather roots hold it into a fair turf.
A ₂	2½-8"	Brown (7.5YR 4/2) when moist, with many white sand grains. A slight lavender suggestion. Slightly coherent sand.
B ₂	8-14" (Variable)	Dark reddish-brown to nearly black orterde, with some irregular banding of ortstein. The soil is mottled with yellow sand in the old root channels. (Perhaps the roots have had the effect of removing the organic matter?)
B ₃	14-20" (irregular)	Transitional. Brown to yellowish-brown sand.
C	About 20"+ (irregular)	Yellow sand becoming paler in depth, with faint yellow and pale brown mottling.

The soil is gently undulating and stone free. It is curious that these pine roots produce the yellowish spots and streaks in the B.



K-1889 August 7, 1950
Holland. North of Wageningen. Profile
of humus Podzol (1a in guide).



K-1890 August 7, 1950
Holland. North of Wageningen.
Landscape -- pine and heather.
(Profile 1a in guide).

Excursion: Wageningen V. Veluwe.

Excursion Point and profile horizon	pH	Organic matter %	Mechanical Composition in %								% van Bemmelen extraction			
			Dutch scheme			American scheme					Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	$\frac{\text{SiO}_2}{\text{Fe}_2\text{O}_3}$
			<16	16-105	>105	<2	2-50	50-200	>200					
1a. 2- 4 cm. A1	4.2	7.5	1.9	8.1	90	-	5.5	26.5	68	0.04	0.13	0.15	0.88	
4- 29 cm. A2	4.3	1.0	1.7	6.1	92.5	0.5	3.8	26.5	69.5	0.11	0.14	0.17	0.68	
31- 36 cm. B1	4.5	4.0	1.5	5.2	93.2	0.5	3.7	22.5	73.2	0.70	0.60	0.25	0.19	
110 cm. ‡ C	5.3	0.5	0.5	1.7	98.0	-	1.3	22.4	76.5	0.21	0.29	0.18	0.36	
1b. 5- 35 cm. A1	4.5	5.0	10.5	18.5	69.5	4.5	14.5	45	34.5	0.81	1.16	0.27	0.14	
35- 90 cm. C1	5.0	1.5	9.5	15.0	75.5	4.0	11.0	58.5	26.5	1.30	1.81	0.15	0.05	
2. 10- 50 cm. C	4.6	0.5	12.0	29.5	58.5	5.0	18.5	57	19.5					
50- 70 cm. C/G	4.4	1.0	15.0	31.5	54.8	9.0	15.5	67	9.8					
3. 0- 40 cm. A0	4.8	4.0	5.0	22.0	74.6	1.0	19.5	29.5	51.6					
40- 60 cm. ^{Alx} B1	5.0	3.0	4.3	22.0	74.0	0.3	19.5	27.5	53					
70-100 cm. C/G	5.1	1.0	1.0	21.5	76.5	-	17.0	27.5	54.5					

Excursion point and profile horizon	pH	Organic matter %	Mechanical composition in %								van Bemmelen extraction			
			Dutch scheme				American scheme				% Fe ₂ O ₃	% Al ₂ O ₃	% SiO ₂	$\frac{\text{SiO}_2}{\text{Fe}_2\text{O}_3}$
			<16	16-105	>105	<2	2-50	50-200	>200					
6. 3-10 cm. A1	4.0	15.5	26.0	67.0	7.7	9.0	80	7	4.7					
10-45 cm. C1	4.3	2.5	18.5	70.5	12.0	9.0	71.5	14	6.5					
45-55 cm. C2	4.2	4.0	21.5	66.0	13.3	9.0	70.5	13.5	7.8					
55 cm. † C3	4.3	1.5	14.5	73.5	12.0	7.0	71.5	15	6.5					
7a. 5-18 cm.	4.0	5.5	7.5	33.5	59.2	4.0	20.0	59	17.2	1.69	0.75	0.19	0.08	
18-37 cm.	4.5	3.0	7.3	34.0	59.5	4.0	19.3	60	17.5	1.71	0.72	0.22	0.09	
37-61 cm.	4.6	1.5	6.0	34.0	60.0	3.5	16.5	61	19	1.72	0.99	0.13	0.05	
82 cm. †	4.6	0.5	0.1	28.0	73.1	-	6.1	75	20.1	0.55	0.66	0.15	0.12	
7b. 35-64 cm.	4.5	0.5	4.2	32.0	64.7	2.5	15.7	66	16.7					
64-85 cm.	4.5	0.5	1.2	25.3	74.9	-	8.5	70	22.9					

Next, we go to profile 1b of the Guide (page 79), where the soil is developed from sandy material containing slightly more clay. The soil has a dark-colored surface but lacks the orterde.

A ₁	0-10"	Very dark gray, slightly loamy, sand; rich in humus.
B	10-20"	Transitional.
C	20" +	Yellow sand with some mottling of hues and some brighter bands of sandy loam and even a few of sandy clay loam.

In the C, some of the local spots suggest a little gleying. Likely I should classify this as a Brown Podzolic soil rather than a Podzol. Although somewhat better than the previous soil, this one is better for forest than for fruit.

Prof. Dr. Edelman then shows us a profile developed under planted beech (No. 2, page 80 of the Guide). Originally this soil was probably a Brown Podzolic, but now it has a micro-Podzol on the surface. The original material was mixed sand and sandy clay till. There is no heather and the soil is good for forest.

The beech gives a brown A₀ some 1 to 2 inches thick. Underneath is a nearly black A₁ 1 to 2 inches thick, and a medium gray A₂ about 2 inches thick.

We then go to look at an old arable soil that received organic matter composted from manure and heather sod for many centuries. It has a well built up A₁ (perhaps such horizons could be called A_{an} — anthropic). (No. 3, page 80 of the Guide.)



K-1891 August 7, 1950
Holland. North of Wageningen. Old
beeches and oaks on sandy soil. (Kellogg
and Parks in picture).



K-1892 August 7, 1950
Holland. North of Wageningen near Niersen.
Landscape on very sandy soil improved through
long use of manure and heather sod compost.
Maize and oats.



K-2036 August 7, 1950

Holland. North of Wageningen. Profile in old arable soil that has received manuring with dung and heather sod for centuries. The A has been thickened by about 12 inches.

0-15"	A ₁ p	Medium gray light sandy loam that is nearly black when moist.
15-23"	B ₂	Brown, reddish-brown, and dark reddish-brown light loamy sand, tending toward orange.
23-30"	B ₃	Transitional. Yellow sand mottled with brown and yellowish-brown.
30" +	C	Pale yellow sand with slight mottling.

On this soil are rather poor crops of maize and oats.

We stop for lunch and then go into the hills. We examine the soil under a beech forest in what Ebelman regards as a loess-filled, flat-bottom gully that was cut by post-glacial erosion in the presence of permafrost. (I am not sure how he knows all this!) There is a nice beech forest. I should call the soil a Young Brown Podsollic. It is a fine sandy loam and rather coarse for loess. (I take a sample at about 2 1/2 inches -- approx. 10YR 5/3 to 5/4.) On one side of the pit, what appears to me to be an old buried A₁ is exposed. Certainly I should not look for the normal soil here as Ebelman suggests. This spot -- the flattened floor of an old gully -- could have been much disturbed; in fact, I should marvel if it hadn't been.

Now we have to hurry again, and we look at a micro-Podsol on red sand (No. 7, page 81 of the Guide). No one seems to be very sure of any kind of explanation for the red color. The area as a whole is a level to undulating sandy plain with very rapid internal drainage. The upper part may have been windblown.

Throughout this plain are small spots of 1 to 2 hectares of deep red soil. They may be related somehow to activities of prehistoric people. Most of the soil is a weakly podzolized Brown Podzolic from yellowish sand (page 82 of the Guide). In great haste I examine the red one and sample the B horizon.

A ₀	1"-0	Leaf mold.
A ₁	0-1½"	Very dark gray light loamy sand.
A ₂	1½-3"	Light brownish-gray light loamy sand.
A ₃	3-16"	Transitional. Reddish-brown light loamy sand.
B	16-28"	Red (5YR 5/8 to 2.5YR 5/8) light loamy fine sand. (Appx. 2.5YR 4/6)
C	28" +	Yellowish sand with some red mottling.

We are back at Wageningen after a very nice day at 6:00.

I have a little chit-chat and then to bed.

Throughout this plain are small spots of 1 to 2 hectares of deep red soil. They may be related somehow to activities of prehistoric people. Most of the soil is a weakly podzolized Brown Podsolite from yellowish sand (page 82 of the Guide). In great haste I examine the red one and sample the B horizon.

A ₀	1"-0"	Leaf mold.
A ₁	0-1 1/2"	Very dark gray light loamy sand.
A ₂	1 1/2-3"	Light brownish-gray light loamy sand.
A ₃	3-10"	Transitional. Reddish-brown light loamy sand.
B	10-28"	Red (2YR 5/8 to 2.5YR 5/8) light loamy fine sand. (Apex. 2.5YR 1/6)
C	28" +	Yellowish sand with some red mottling.

We are back at Weymeningen after a very nice day at 6:00.

I have a little chit-chat and then to bed.

P-LXXXII



K-2037 August 7, 1950
Holland. Near Ginkel. Micro-podzolic profile in
red sand. No explanation exists for the red color.

August 8

This promises to be an excellent day for the excursion to see the river deposits (page 83 of the Guide).

Our first stop is at a very nice brown Alluvial soil. The upper part has a mixed granular and fine blocky structure, while the lower part is fine to medium irregular blocky. The texture is about a fine sandy clay loam. The soil is friable. At 30 inches it is dark yellowish-brown (10YR 4/3).

Land like this rents for about 120 guilders per hectare per year with only a little fertilizer required. The water table is usually at one meter or more, although part of the time it is quite near the surface.

This soil reminds one very much of the Huntington in the United States. One hectare carries one milking cow annually for both hay and pasture. This yield could be increased by better fertilization, which is discouraged by the system of short-term leasing. The adjoining pasture has mostly ryegrass with some orchardgrass.

At the second stop we see a Gray-Brown Podzolic soil from river alluvium (No. 2, page 85 of the Guide).

A _p	0-12"	Dark yellowish-brown (10YR 4/4) gritty loam. Firm in place. Mixed subangular blocky and granular.
B ₂	12-24"	Yellowish-red (5YR 4/6) sandy clay loam. Irregular blocky structure, with vertical breakage. Fairly compact in place, but friable with medium pressure.

August 8

This promises to be an excellent day for the excursion

to see the river deposits (page 83 of the Guide).

Our first stop is at a very nice brown alluvial soil.

The upper part has a mixed granular and fine blocky structure,

while the lower part is fine to medium irregular blocky. The

texture is about a fine sandy clay loam. The soil is friable.

At 30 inches it is dark yellowish-brown (10YR 4/3).

Land like this rents for about 120 bushels per hectare

per year with only a little fertilizer required. The water table

is usually at one meter or more, although part of the time it is

quite near the surface.

This soil reminds one very much of the Huntington in the

United States. One hectare carries one milking cow annually for

both hay and pasture. This yield could be increased by better

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orchardgrass.

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river alluvium (No. 2, page 85 of the Guide).

Dark yellowish-brown (10YR 4/3)
gritty loam. Firm in place. Mixed
subangular blocky and granular.

0-12"

A_p

Yellowish-red (5YR 4/6) sandy clay
loam. Irregular blocky structure, with
vertical prisms. Fairly compact in
place, but friable with medium pressure.

12-24"

B₂

B ₃	24-36"	Strong brown (7.5YR 5/8) gritty loam with weak blocky structure. Friable.
D	36" +	Relatively loose loamy sand.

The soil is undulating and well drained. Roots penetrate the whole solum. The soil here is more leached and somewhat more dry than at the first profile. The water table lies at 10 feet or more.

Besides small grains, potatoes, vegetables, and pasture, there are several small plantings of maize, which is used mainly for chicken feed on small poultry farms.

There are no records of forest on this soil. The land was known to be arable before 800.

Our bus has an accident with a truck while we are out in the field. I get one or two pictures and then sit down with the others to wait for the police. Everybody has a drink and there seems to be no hard feelings.

We next look at a soil on imperfectly drained river clay over gray sand (profile 4a of the Guide, page 85).

A _p	0-6"	Brown loam; mixed granular and sub-angular blocky.
B ₁	6-14"	Highly mottled reddish-brown, yellowish-brown, and gray sandy clay loam, with strong angular blocky structure tending toward prismatic.
B ₂	14-28"	Similar to B ₁ , but with a bit more clay. Some graying along the root channels.
D _g	28" +	Wet gray loamy sand. The water table is now at about 6 feet.

P-LXXXIII



K-2038 August 8, 1950
Holland. Between Mook and Cuyck. Profile of
fertile brown Alluvial soil.

P-LXXXIV



K-1893 August 8, 1950
Holland. Between Mook and Cuyck.
Landscape on brown Alluvial soils.
(Profile 1 of guide.) (Dr. Low.)

I should be inclined to call this soil a slightly planosolic Humic-Gley, although perhaps the organic matter is a bit too low. The pasture is fairly good.

We only take a quick look at an adjoining soil that is a combination of peat and alluvium (4b, page 88 of the Guide).

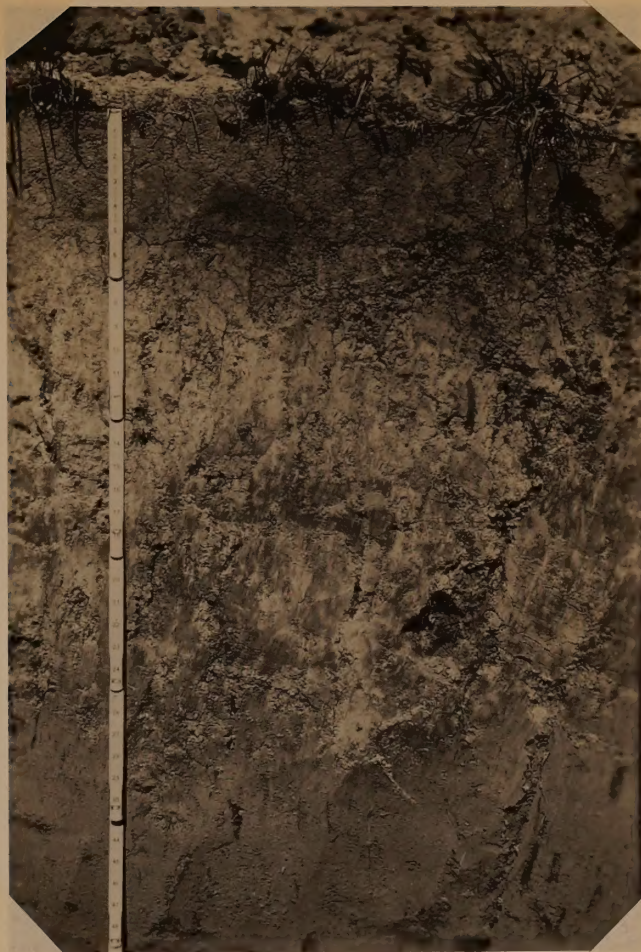
We pass on to an area with a varying cover of windblown sand over river "loams." Part of this soil is arable; part in grass; and some is in fruit. The drier sites are forested.

After lunch we look at a poorly drained clayey Humic-Gley soil from alluvium (profile 5, page 88 of the Guide). This soil appears to me as an intergrade between the Brookston and Nappanee of southeastern Michigan. The water table is at about 1 meter. Here this kind of soil is considered to be useful only for grass, partly because of the difficulty of the structure.

The surface 2 to 4 inches of grayish-brown clay is finely mottled with reddish-brown. Roots bind the soil into a turf. This surface is underlain by medium gray clay that dries out into large, weakly prismatic blocks. This soil is mottled a little with reddish-brown and dark gray. The material is very hard when dry. I take a picture of the local haying on this soil.

We are then shown a profile in an old arable soil on a high river terrace (No. 6, page 89 of the Guide).

A _p	0-10"	Dark grayish-brown heavy silt loam; firm, but easily friable.
A _{1b}	10-20"	Very dark gray to nearly black silty clay. Friable, weak irregular blocky.



K-2039 August 8, 1950
Holland. Near Maldense brug. Profile of imperfectly
drained soil from stratified material. (Slightly
planosolic Humic-Gley).

Mechanical and chemical composition of soil profile samples

Excursion: Wageningen VI, excursion point no. 4b, deep gully of the pleistocene braided Rhine system, filled up with peat. Near Maldense brug, Malden.

Fractions of the tot.s. in perc.				Fract. of the min. part of the sample in perc.										
Layer of sample	pH	CaCo3 content	Humus content	Dutch scheme			American scheme				P (H2O extr.) p.p.m.	P (citr. ac. extr.) p.p.m.	K2O (0.1 n. H.C.1 extr.) p.p.m.	
				0-16	16-105	>105	< 2	2-50	50-200	>200				
0 - 30	5.8		11	37	5.5	57.5	23	17.5	12.5	47	10	180	0.090	
30 - 45	5.1		9,5	71	7	22	39	38	4	19				
45 +	4.7		32	95	2.9	2.1	70	27.3	2.1	0.6				
Excursion point no. 5a, gully of the pleistocene braided Rhine system filled up with holocene basin-clay, at bottom slightly peaty Beuningse broek, Beuningen.														
0 - 18	5.7		9	94	5.6	0.4	73	25.3	2	0.7	10	50	0.130	
18 - 60	6.3		1.7	89	7	4	64	30	4	2	10	30	0.130	
Excursion point no. 5b, small river ridge of the pleistocene braided Rhine system (loam) covered up by a thin layer of basin-clay Beuningse broek, Beuningen.														
0 - 14	6.2		13	75	14	11	54	31	10	5	10	90	0.130	
14 - 32	8.0	0.30	2.1	66	18	16	46	33	10	11	10	50	0.090	
32 - 60	7.7	0.11	0.4	51.5	16.5	32	34	28.5	20.5	17				
Excursion point no. 6, young brown river ridge soil, "De Ouwel" Beuningen.														
0 - 25	7.2	0.09	2.5	38	41.5	20.5	17	52	18.5	12.5	70	1510	0.220	
25 - 52	6.6	0.12	1.0	57	32	11	36	46	11.5	6.5	80	2340	0.130	
60 +	6.9	0.06	0.4	56	32	12	35	43	17	5	50	1160	0.130	

Mechanical and chemical composition of soil profile samples

Excursion: *Wageningen VI*, excursion point no. 1, young washland clay deposit of the Meuse. High, non-calcareous, fine-sandy, brown washland clay soil, along the road from Mook to Cuyk.

		Fractions of the tot.s. in perc.		Fract.of the min.part of the sample in perc.							<i>K%</i>		
Layer of sample	pH	CaCo3 content	Humus content	Dutch scheme			American scheme				P (H2O extr.) p.p.m.	P (citr.ac. extr.) p.p.m.	K2O (0.1.n. H.C.1 extr.) p.p.m.
				0-16	16-105	>105	<2	2-50	50-200	>200			
0 - 12	6.6	0.10	11	61	37	2	32	62	5,5	0,5	10	250	0.090
12 - 96	7.4	0.08	2.5	60	37.5	2.5	30	64.5	5	0.5	10	70	0.080
96 †	7.9	0.08	0.8	35.5	48	16.5	17	59.5	22	1.5			

Excursion point no. 2, sandy, brown river loam. High brown loam-soil. Near Ottersum.

0- 41	5.0		1.7	21.5	17	61.5	10	23	24.5	42.5	10	200	0.090
41 - 60	5.1		0.8	32	20.5	47.5	19	26.5	23.5	31	10	80	0.060
60 - 96	5.3		0.4	27	24.5	48.5	17	22.5	36	24.5			
60 - 96	5.3		0.3	19	17.5	63.5	13	13.5	44	29.5			
96 †	5.6		0,5	0	1.6	98.4	0	1.1	13.5	85.4			

Excursion point no. 4a, river ridge along a deep gully of the pleistocene braided Rhine system. Shallow variegated loam on sand. Near Maldense brug, Malden.

0 - 14	5.9		7.5	47	23	30	28	32	35	5	10	80	0.080
14 - 40	5.7		0.7	34	28.5	37.5	23	25.5	46	5.5	10	30	0.060
62 †	5.7		0.1	7.4	15	77.6	3	8.4	81	7.6			



K-1894 August 8, 1950
Holland. Near Ottersum. Landscape
on Gray-Brown Podzolic soils.



K-1895 August 8, 1950
Holland. Near Beuningse Broek.
Harvesting grass.

B _{31b}	20-24"	Transitional.
B _{32b}	24-36" +	Mottled dark gray and brown heavy clay. Generally massive, with very weak irregular small blocky. Many tiny concretions, probably with manganese.

This soil was farmed in Roman times. Artifacts are found at about 24 inches. The top of the old arable soil in Roman times came at the top of B_{32b}. This was added to by compost and manure, and possibly a little from the river. The top 10 inches, now the A_p, was derived mainly from river overflow.

The soil is used mainly for sugarbeets, small grains, grass, and orchards. This old soil is very rich in phosphorus.

Our bus then goes to the cemetery of the famous airborne troops, mainly British, near Arnhem. This is the most beautiful and best-cared-for cemetery I have ever seen. While we are there a group of Welsh visit the cemetery in their native costumes.

There has been a good deal of speculation about this terrible battle at Arnhem. Some say that a Dutch traitor informed the Germans of the British plan. I am more inclined to the later view, that the Germans had just by chance regrouped some of their Panzer divisions near Arnhem. Apparently, if the British had landed just two or three days earlier or later, they would have been successful. As it was, nearly two-thirds of the British forces were casualties, and I understand they accounted for even more Germans.

P-LXXXVII



K-1896 August 8, 1950
Holland. Near De Ouwel. Landscape on
old land farmed since Roman times.

At the end of the day we are shown some of the small plots at the school near Wageningen. These are merely demonstration plots for the students, so I walk on to Professor Edelman's house and have time for a bath before dinner.

Very early to bed this night, after being fitted for wooden shoes.

August 9

We are up early and pack our baggage for Breda. At 8:30 we leave in the buses for an excursion in the fruit-growing district on the river clay (page 69 of the Guide).

At the first stop we look at a profile of clayey brown Alluvial soil with weak coarse angular blocky structure in the B, suggesting a tendency toward Gray-Brown Podzolic (No. 1, page 71 of the Guide). Here is mostly grassland and orchards with some arable land and a few pigs and chickens. There are many open ditches. Annual rent for this land varies from 40 to 120 guilders per hectare. Perhaps one-half of the land is rented and one-half managed by the owners. With full-bearing trees, the annual rent goes to about 250 guilders. On the trees they use about 250 kilograms of nitrogen in the form of ammonium calcium nitrate ($20\frac{1}{2}$ percent N), 250 kilograms of K_2O , and 150 kilograms of P_2O_5 . Some of the orchards also require magnesium.

This soil is on the edge of Kesteren, which we pass in order to examine an old arable soil built up since Roman times. Pressed for a name, I should have to call it a "kitchen midden" phase of an intergrade between Gray-Brown Podzolic and Alluvial. (Profile No. 2, page 71 of the Guide.) The upper two feet has been built up by the long use of composted manure and other refuse, mainly of Roman times. One sees some bone artifacts. The soil is



K-1897 August 9, 1950
Holland. Near Kesteren. Landscape
on heavy river ridge clay; grass and orchards.



K-1898 August 9, 1950
Holland. Near Kesteren. On ancient settlement
soil. View from the edge of the old site at
left; imperfectly drained soil at the right and
middle background.

Mechanical and chemical composition of soil profile samples.

Excursion: WAGENINGEN IV, excursion point 1, Kesteren near the railway-station (river ridge soil, Rs3)

Layer of sample	pH	Fractions of the tot.s. in perc.		Fract. of the min.part of the sample in perc.							K %		
		CaCo3 content	Humus content	Dutch scheme			American scheme				P (H2O extr.) p.p.m.	P (citr.ac. extr.) p.p.m.	K2O (0.1.n. H.C.l. extr.) p.p.m.
				0-16	16-105	>105	<2	2-50	50-200	>200			
0- 15	6.3		7.5	54	31.5	14.5	29	46	17.5	7.5	70	660	0.340
15- 90	7.7	0.10	1.3	66	25	9	40	46	10	4	10	80	0.090
90- 118	8.0	0.09	0.4	14	29	57	9	17	41	33	10	410	0.040
118 +	8.5	12.8	0.7	47	36	17	26	46	20.5	7.5	10	320	0.080
Excursion point 2. Kesteren, Hoge Woerd, (ancient settlement soil, Rp)													
0- 20	6.7	0.59	7.5	39.5	30	30.5	24	32.5	29	14.5	200	6700	0.200
20- 72	7.3	3.1	3.4	39.5	33	27.5	23	34.5	31	11.5	160	4600	0.140
72-100	7.8	9.6	0.8	23	36.5	40.5	13	22.5	56	8.5	110	5850	0.100
100-114	7.8	14.1	0.3	15.2	42.5	42.3	10	14.7	73.8	1.5	.70	3140	0.080
114-134	8.1	13.7	0.4	26	43	31	13	32	51	4	60	2760	0.090
134 +	7.7	8.5	0.3	6.5	11	82.5	3.5	8	70	18.5	60	1770	0.060
Excursion point 3a, Valburg (old sandy soil, Rd)													
0- 70	6.4	none	2.5	14.5	5.5	80	9	8.5	24.5	58	150	2000	0.340
70 +	6.3	"	1	3.5	3.4	93.1	3	1.9	25	70.1	120	1290	0.090

Mechanical and chemical composition of soil profile samples.

Excursion: WAGENINGEN IV, excursion point 3b, Valburg (basin clay soil, Rk)

Layer of sample	Fractions of the tot.s. in perc.			Fract. of the min.part of the sample in perc.								P (H2O extr.) p.p.m.	P (citr.ac. extr.) p.p.m.	K2O (0.1 n. H2SO4 extr.) p.p.m.
	pH	CaCo3 content	Humus content	Dutch scheme			American scheme							
				0-16	16-105	>105	<2	2-50	50-200	>200				
0- 10	6.8	0.70	12.5	72	12.5	15.5	44	38.5	6.5	11	110	1660	0.660	
10- 38	6.6	0.09	4.2	78	7	15	46	38	6	10	20	370	0.170	
38- 80	6.3		2.4	88	5.5	6.5	53	39.2	3.4	4.4	20	110	0.120	
80-132	6.7	0.10	1.4	86	5.8	8.2	57	34.7	3.1	5.2	20	240	0.190	
132 +	6.6	0.04	3.7	95	3.1	1.9	60	38	0.8	1.2	10	270	0.200	
Excursion point 4, Valburg to				Elst (orchard on river-bed soil, Rsb)										
0- 10	6.9	0.38	8.5	68	19.5	12.5	39	42.5	12.5	6	60	1890	0.450	
10- 41	7.3	0.04	2.3	69	19.5	11.5	41	43	12.5	3.5	10	250	0.180	
41- 93	7.4	0.09	1.8	76	18	6	50	38	10.5	1.5	10	400	0.150	
93-113	7.7	4.1	1.6	80	14	6	48	43	6.5	2.5	20	1300	0.190	
113-136	7.6	6.8	3.1	85	13.5	1.5	53	43.5	2.8	0.7	10	200	0.160	
136 +	7.4	15.3	6	80	18	2	52	44.7	2.4	0.9	10	310	0.180	

Excursion: WAGENINGEN IV, excursion point 5, Elst (cherry orchard, sandy river ridge soil, Rs)

Fractions of the tot.s. in perc.				Fract. of the min.part of the sample in perc.							K%		
Layer of sample	pH	CaCo3 content	Humus content	Dutch scheme			American scheme				P (H2O extr.) p.p.m.	P (citr.ac. extr.) p.p.m.	K2O (0.1 n. H.C.l. extr.) p.p.m.
				0-16	16-105	>105	<2	2-50	50-200	>200			
0- 5	6.4		2.5	36	41	23	20	42	26.5	11.5	100	590	0.490
5-20	7.4	0.14	1.3	38	39	23	21	41	26.5	11.5	20	300	0.100
20-43	8.0	3.6	0.9	36	44.5	19.5	21	39.5	30.5	9	10	80	0.079
43-63	8.3	8.6	0.6	23	36.5	40.5	14	28.5	23.5	34	10	130	0.070
63 ↓	7.8	0.36	0.2	0.9	0.7	98.4	0.2	1.1	6.3	92.4	10	100	0.030

Excursion point 6, Huissen, (dike-breach deposit soil, Ro)

0-25	7.1	2.3	5	12.5	12.5	75	6	12	37	45	230	4450	0.540
25-47	7.4	2.5	2	8	16	76	5	11	40	44	140	1110	0.390
47-68	7.5	3.6	0.5	5.7	13	81.3	3	8.7	33	55.3	70	290	0.200
68-79	7.5	1.7	0.5	1.7	3.5	94.8	1	2.2	12	84.8	40	200	0.100
79-98	7.4	8.1	0.5	11	26.5	62.5	6	15.5	53	25.5	70	360	0.250
98-103	7.7	2.3	0.2	3.8	4	92.2	1	4.3	14.5	80.2	40	150	0.100
103 ↓	7.9	9.9	0.7	34.5	45	20.5	21	38.5	29.5	11	20	210	0.310

very rich in phosphorus. Some of this has crystallized out as iron-calcium phosphate in yellowish-green accretions.

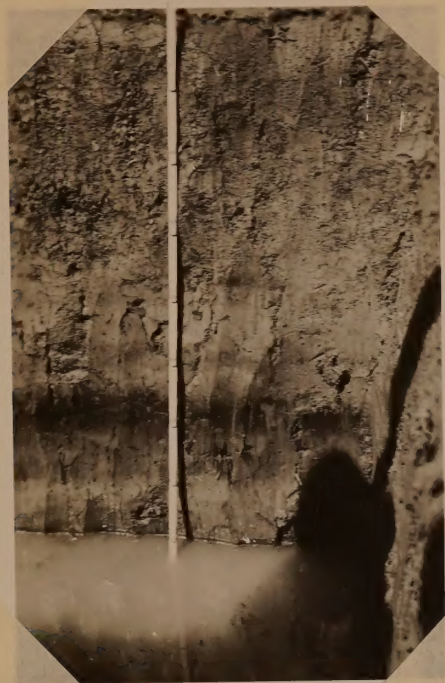
The soil is highly productive of orchards, but is not very well managed, partly because of non-resident ownership and renting. Pastures are poor from lack of mowing. This site should be used for orchards. It is on a low mound and well drained, although surrounded by imperfectly drained soil.

Near the village of Ochten, we pass through an area where nearly everything was destroyed during the war and rebuilt since that time on some of the best soils in the district. I take pictures near Dodewaard and we pass Andelst, a village built on some more of these old arable soils. The ones here are especially good for cherries, which are said to have a special flavor. I photograph one of the older mills built in 1722. I am told to label it "Standaard-Mill in Herveld."

We then look at a low clayey soil, an intergrade between Alluvial and Humic-Gley. An old lower surface can be seen at 34 inches. The upper 5 or 6 inches are fine blocky, grayish-brown clay, held together by grass roots, but hard when dry. From 21 to 34 inches is gray clay mottled with yellow. The old buried surface soil from 34 to 43 inches is dark gray clay. This, in turn, is underlain by light to medium gray clay. In winter, the water is at the surface. In Holland, this kind of soil is considered

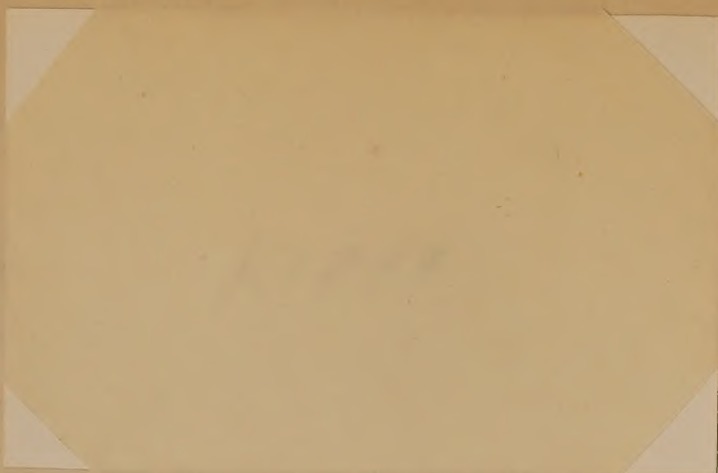


K-1899 August 9, 1950
Holland. Standaard-Mill in Herveld,
built in 1722.



K-1900 August 9, 1950
Holland. East of Ochten. Profile of
Humic-Gley Alluvial soil. Note old
soil surface at 34 inches.

P-121111



K-1899 August 9, 1950
Holland. Standard-Mill in field.
built in 1732.



K-1900 August 9, 1950
Holland. East of Center. Profile of
Hemic-Grey Alluvial soil. Note old
soil surface at 34 inches.

poor for pasture. It is too dry in summer and too wet in winter, and they do not find it possible to control the water table.

We then look at a soil from a sandy bench of the river in an orchard (3a of page 72 of the Guide).

A _p	0-20"	Grayish-brown light sandy loam. For many years this soil has had heavy manuring with sheep manure for tobacco, although now most of it is used for fruit and vegetables.
C	20-50" +	Loose, yellowish sand, nearly structureless. The water table is at about 3 meters.

Our next stop is to see a soil from the so-called "basin clay." This one has somewhat better drainage and a deeper brown surface soil than the earlier one we saw on the heavy clay. It is used for orchards, but they are only fair because of relatively poor structure. The pears are better than the apples. In the North Eastern Polder, soils like this are always wet. If allowed to become thoroughly dry, the soil cracks irreversibly. That is, I am told that 100 parts of water and 100 parts of soil will only rewet to 100 parts of soil, 60 parts of water, and 40 parts of pore space. On this alluvial clay, however, the material dried from time to time as it was laid down, so that in winter there are no cracks at all.

This strikes me as a very important fact to remember in contrasting clayey soils from irregularly drained alluvium on

the one hand and those from continually wet deltas on the other. Here, on this basin clay, the soil is dense, whereas in the North Eastern Polder the soil drains fairly well with tiles at considerable distance, because of the permanent cracking.

We have lunch at Elst and then go on to look at the soils in an orchard (see profiles and maps, page 74 and 75 of the Guide). The first one (Rs1) is a brown silty clay loam over yellowish-brown silty very fine sandy loam, with sand at 24 inches. The water table stands at 6 feet. This soil is not quite so good for fruit as Rs3, where the sand is coarse in the lower part.

I am told that the fruit trees here -- apples, cherries, pears, and plums -- are sprayed 10 times each year. Many trunks show the scars of the war, and some were destroyed. In fact, this whole area was a big battle ground. It was a big job to remove the mines. German prisoners were required to remove them and to break the land. But some mines were missed.

We enter Huissen, that lies on a so-called "scoured" area -- scoured by water from a break in the dike. Here there are vegetables, orchards, and many glasshouses.

On the sandy soil, vegetable growing is intensive, with three crops each year. I see a good many glasshouses for both tomatoes and grapes.

We examine a profile within one of the glasshouses (No. 6, page 76 of the Guide) developed from deposits from a break in the dike. In early spring, before the grapes have thrown out their leaves, lettuce is grown. The water table stands at $2\frac{1}{2}$ meters, and the soils are irrigated with furrows. The grapes look good. The harvest is said to be 1,250 kilograms in this glasshouse that is 50 by 8 meters (1/10 acre, approximately). In split applications, they use per hectare 500 kg. of N, 700 of K_2O , and 700 of P_2O_5 , besides 2 tons of farm manure per glasshouse. Some of the people in the advisory service tell me that perhaps too much fertilizer is used. I see some clear evidences of magnesium deficiency, perhaps from too much K or Ca and K together. Here the soil has been rather thoroughly worked for at least 20 inches.

A _{p1}	0-10"	Grayish-brown, granular, sandy loam with much humus.
A _{p2}	10-20"	Yellowish-brown light loam; moist.
B	20-35"	Yellowish-brown fine sand.
C	35" +	Coarsely mottled and streaked gray and pale brown sand.

We then go to Nijmegen to take the train for Breda. We reach Breda about 5:50. I am very tired this evening, and now find that I am supposed to go to a lecture.

First we have an explanation of the reallocation of lands on Walcherin Island. This area was originally a complicated

We examine a profile within one of the glasshouses (No. 6, page 76 of the Guide) developed from deposits from a break in the dune. In early spring, before the grapes have thrown out their leaves, lettuce is grown. The water table stands at 1.5 meters, and the soils are irrigated with furrows. The grapes look good. The harvest is said to be 1,250 kilograms in this glasshouse that is 50 by 8 meters (1/10 acre, approximately). In split applications, they use per hectare 500 kg. of N, 700 of K₂O, and 700 of P₂O₅, besides 2 tons of farm manure per glasshouse. Some of the people in the advisory service tell me that perhaps too much fertilizer is used. I see some clear evidences of magnesium deficiency, perhaps from too much K or Ca and N together. Here the soil has been rather thoroughly worked for at least 20 inches.

Grayish-brown, granular, sandy loam with much humus.	0-10"	A ₁
Yellowish-brown light loam; moist.	10-20"	A ₂
Yellowish-brown fine sand.	20-35"	B
Coarsely mottled and streaked gray and pale brown sand.	35" +	C

We then go to Hjørring to take the train for Brøndby. We reach Brøndby about 8:30. I am very tired this evening, and now find that I am supposed to go to a lecture. First we have an explanation of the relocation of lands on Walcheren Island. This area was originally a complicated



K-1901 August 9, 1950
Holland. East of Ochten. Landscape
on Humic-Gley Alluvial soil.



K-1902 August 9, 1950
Holland. Near Huissen. Examining profile
in glasshouse used for grapes.

pattern of tiny, irregular plots. The dikes were bombed by the Allies during the liberation of Holland, and the area flooded with salt water. Everything had to be rebuilt. The soil had to be reclaimed, so they planned to do a complete job, with new roads and new drainage canals. Some of the "extra" people have been moved to the North Eastern Polder. This is followed by introductions in English and French to a film showing the inundation of Walcherin and the improvement of the saline soils produced by the sea. This is a good propaganda film intended to explain to the farmers and their families what must be done and why, in order to reclaim the soil and set it right.

Very tired and late to bed.

August 10

We are up early to take the train for Middleburg and the tour to Walcherin Island (Page 90 of the Guide). After we pass Bergen op Zoom, there is an area of intensive gardening and fruit-growing. A few old sand dunes are planted to pine. A lot of asparagus is grown on the light sandy soils on the gentle slopes of the dunes. Then from the train I see small grains, potatoes, grass, and sugarbeets on the low, diked, tidal plains. Beyond, there is alfalfa and maize along with the other field crops. Then again we see many orchards of apples and pears, often mixed. Some of these are clean cultivated in contrast to the heavy grass sod under most of those we saw yesterday.

We reach Middleburg about 10:00. In the buses we have a short lecture on the organization of the research: (1) the use of gypsum on the saline soils, (2) soil survey, and (3) reallocation of the land, including roads, leveling, drainage ways, and tile drainage.

It rains, and we are given heavy rubber boots.

In much of this area is a complex of small and medium-low ridges of sandy soil from the old creeks. Between these are lowlands of heavier soil, often underlain by peat. Some of these were eroded out during old invasions of the sea. In some,



SIMPLIFIED SOIL MAP OF THE ISLAND OF WALCHEREN

LEGEND

MO	Marine clay soils of the Old Land
MM	Marine clay soils of the Middle Land
MN	Marine clay soils of the New Land
MOK	Creek ridge soil (sandy clay)
MOt MOp	Transitional soil (clay) and pool soils
MOa	Covered up soil
MMb	Low creek-bed soil
MMk	Young calcareous, young creek ridge soil
MMr	Young creek ridge soil with a low CaCO_3 content

MMt MMp	Young transitional soil and pool soil
MN1	Clay-shoal soil („kleiplaat” soil)
MN3	Tidal marsh soil („schor” soil)
D	Dunes

The dune landscape is indicated on this map as a blank zone on the western and northern border. The area to the south of the „Vrouwenpolder” and the district of Arnemuiden and Nieuwland have not been mapped.

The black gullies near West-Kappelle, Veere, Ritten and Flushing represent inundation-creeks.

the peat was removed in the Middle Ages for the manufacture of salt. These old workings are now expressed in the microrelief. We look at both the creek soils and the peat soils (see Guide). Most of the roads, villages, and farm houses are located on these old creek soils. Some of the old poorly drained soils are now being drained and made useful for arable land, not just for grass as formerly.

We look at one of these soils on a creek ridge (1a, page 91 of the Guide) while it rains hard. The surface 8 inches (A_p) is grayish-brown light fine sandy loam. This is underlain by stratified loamy fine and very fine sand. There are some strata of gravel at about 6 feet.

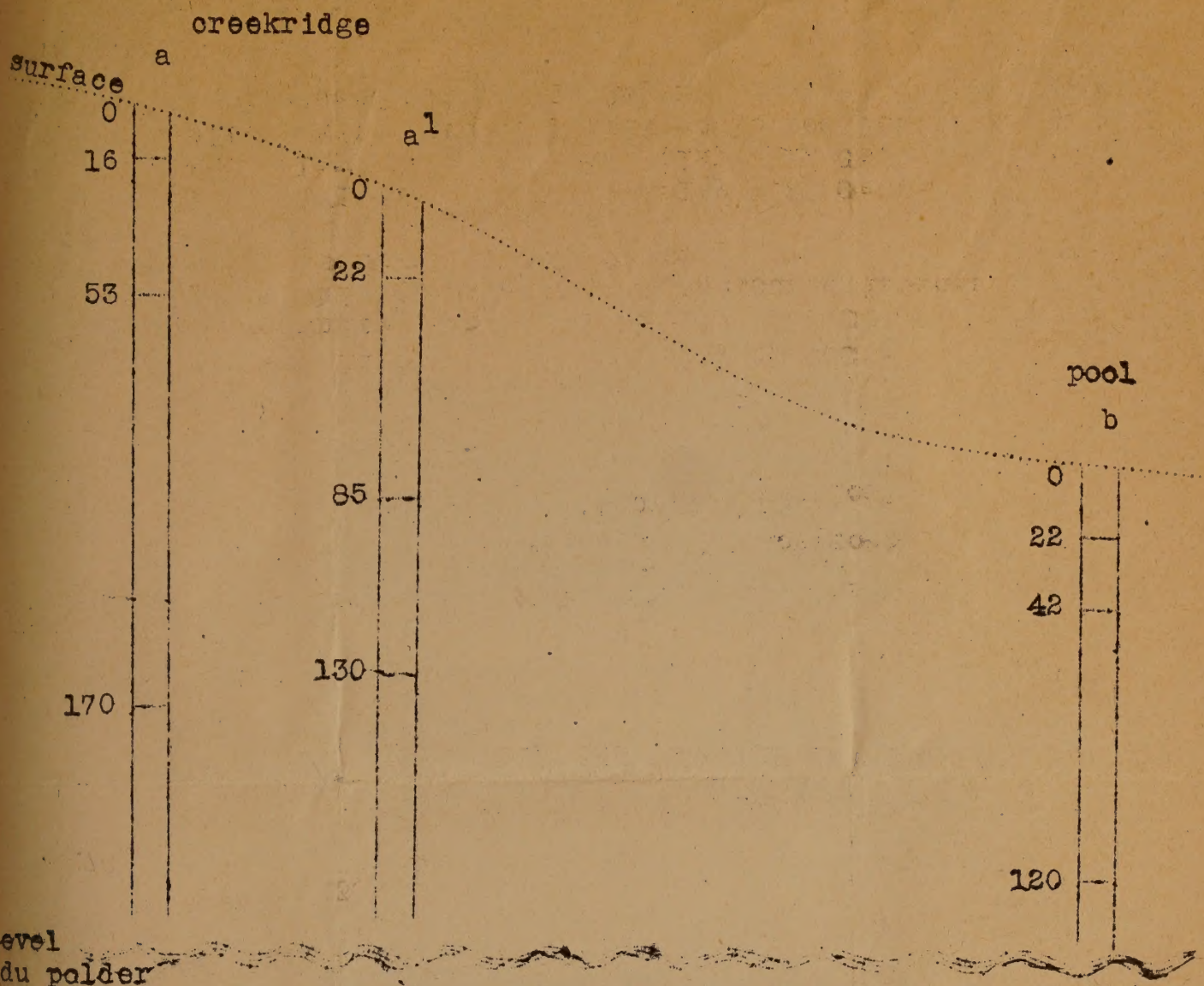
Beyond, we see a soil with a very fine sandy loam surface, but with a hard, coarsely prismatic B due to solonization.

We look hurriedly at a profile between the creek soils (1b, page 91 of the Guide). Generally, the surface is medium gray clay loam with nearly black peat at $1\frac{1}{2}$ meters.

Although it rains very hard now, I try to get some pictures of the microrelief from the peat digging.

We then go to a demonstration of an instrument used for the rapid determination of soil permeability. This is a clever instrument. One makes a hole in the soil, determines the height to the water table, pumps out the water, and measures accurately the speed with which it fills again. On the basis of empirical

SITUATION OF THE DEMONSTRATED PROFILES
SITUATION DES PROFILS DEMONTRES



scale { horizontal 1 : 1000
l'échelle { vertical 1 : 20

creekridge soil

Profile a	0-16	ploughed layer	11% clay 3% CaCO ₃	
	16-53	yellow white sand	3% clay 7% CaCO ₃	
	53-170	yellow white sand with rust coloured laminates	2% clay 5% CaCO ₃	
	170-deeper	blue sand with shell layer	2% clay 5% CaCO ₃	
Profile a1	0-22	ploughed layer	9% clay 1.2% CaCO ₃	
	22-85	sandy clay	15% clay 11% CaCO ₃	
	85-135	yellow white sand with rust coloured laminates	5% clay 8% CaCO ₃	
	135-deeper	blue sand with shell layer	5% clay 8% CaCO ₃	

pool soil

Profile b	0-22	ploughed layer	21% clay 0.7% CaCO ₃	
	22-42	brown grey clay with yellow brown rustspots	25% clay 0.9% CaCO ₃	
	42-120	brown grey clay with yellow brown rustspots	35% clay 1.0% CaCO ₃	
	120-140	black peat mixed with blue clay		

P-XCI



K-1903 August 10, 1950
Holland. Northwest of Middleburg. On
lowland, "pool" clay over peat, looking
to "creek ridge" soil. Soil in foreground
has 10% exchangeable Na from flooding. (Rain)



K-1904 August 10, 1950
Holland. Northwest of Middleburg. Common
Type of compost heap. (Mr. W.S. Martin
of South Africa.)

equations, the advisers can recommend tile spacing. In ordinary advisory work, four test holes are made per hectare.

We then drive nearly to the dike south of Koudekerke, where reallocation has gone forward. The parcels are larger than formerly, and all the land is tile drained. The job is still not finished administratively. Some large parcels yet have crops in accord with the old land rights. Here the inundation deposited silt to depths of 30 to 40 centimeters. Ordinarily, this improves the soil, so that some former grasslands can be made into arable land with leveling. I notice a few tiny high hills. These are said to be remnants of the Middle Ages. They may have been of military use. They were used by refugees during the inundation.

After lunch it still rains while we go to see the effects of gypsum on the saline soils.

The land is now in wheat, and treatments listed on page 94 of the Guide have obviously had an important effect on yield. Fortunately, one in our party has an umbrella so I am able to photograph the upper part of the solum where the soil had received 6.6 tons of gypsum per hectare and also the upper solum of the check plot. It will be noted that where the gypsum has been used, the soil has the characteristic prismatic B of Solonetz below about 6 inches of soil with granular structure. The gypsum was applied in 1946, and according to my guides, some improvement was noted almost at once.



K-1905 August 10, 1950
Holland. Northwest of Veere. View of
upper soil, treated with 6.6 tons of gypsum
per hectare on soil flooded by sea water.
Note prismatic structure. (Rain)



K-1906 August 10, 1950
Holland. Northwest of Veere. Check plot
of sea-flooded soil having no gypsum.
Compare with K-1905. (Rain)

In this development, the calcium sulphate has cost about 50 guilders per ton. Some 17,000 hectares have a significant salt content and the gypsum will cost about 15,000,000 guilders. For reclaiming these areas salted during the war, the gypsum is furnished to the farmers by the government.

We go on during heavy rain and stop at Westkapelle, where the Allies broke the dike that flooded this area and where they landed. I get a photograph that shows the new dike that is somewhat nearer the land than the old dike. Unfortunately, a German pillbox nearby caused many casualties among the Canadian assault troops until it was put out of action by a well-directed shot from a British warship out at sea.

We drive on and stop at Veere to see one of the most beautiful town halls I have ever seen in Europe. It has a gorgeous set of chimes. The town hall was built around 1460 and, fortunately, was not much damaged during the war.

Our bus takes us to Middleburg and we go back by train to Breda. After a discussion of the recent soil survey work in the peat lands in the North Eastern Polder, I am early to bed.



K-1907 August 10, 1950
Holland. Westkapelle. New dike to replace
one bombed out in 1944. The old dike ran
to the right of this one and connected directly
with the sand dune in the back. Allied troops
landed here. (Campbell, Australia; and Archibald,
Canada). (Rain)



K-1908 August 10, 1950
Holland. City Hall of Veere.

August 11

This morning we start on a field trip to the Westland, west of Rotterdam. After passing the urban area near Rotterdam, we enter an area that has been mapped by the soil survey and pass over a large tract of old peat land. The soil material consists essentially of from 10 to 15 meters of soft clay and peat that has settled following its improvement for pasture. Here I get a picture of one of the old canals built in the 13th century which is now higher than the adjoining land because of this settlement.

We continue west over low clayey soil that is partly arable and partly grassland, and then come to Westerlee, where there are large numbers of glasshouses, about one-quarter of which are heated with coal, and used for grapes, tomatoes, and other vegetables. Mellons and cucumbers are grown in low houses. Besides, vegetables and some fruits are grown on the soil between the glasshouses.

We then drive in the direction of The Hague and stop at a farm near Wintsheul (?). This is somewhat higher and sandier soil used intensively under glass, and for vegetables and small orchards between.

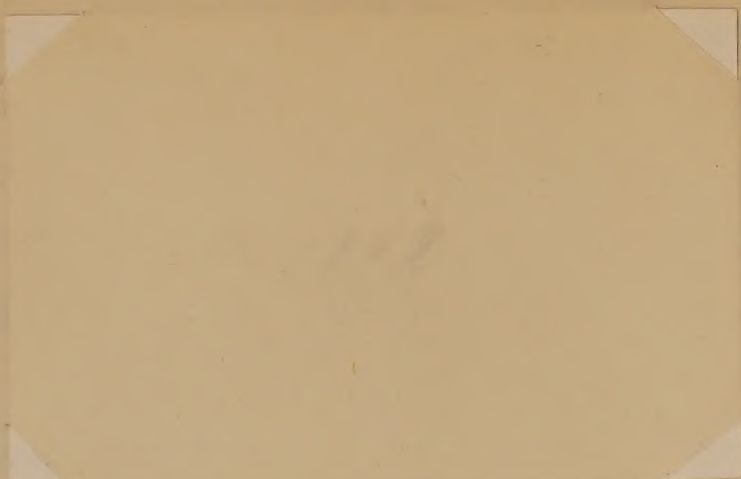
In a little way we make the stop described on page 97 of the Guide. The 3-hectare farm here has an investment of about 2,000,000 guilders in land, glasshouses, and other facilities.



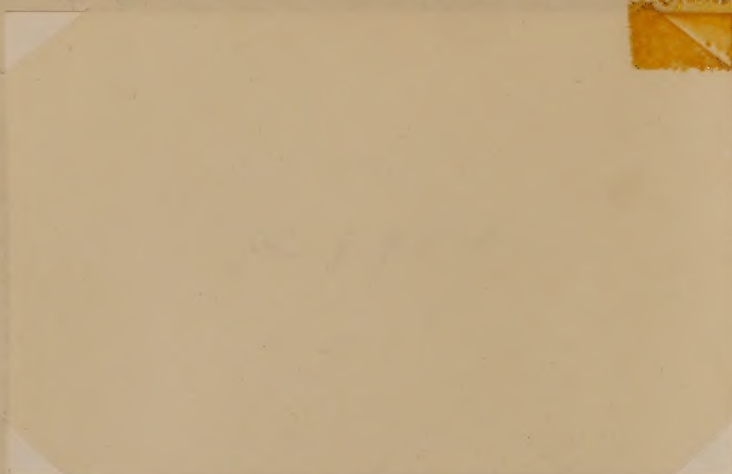
K-1909 August 11, 1950
Holland. Near Maassluis. Intensive
vegetables on "shipped up" soil. Smoke
stacks are from glasshouse heating plants.



K-1910 August 11, 1950
Holland. Near Arendsduin. Protected sand
dunes, serving as dikes.



E-1009 August 11, 1950
Holland, West Massachusetts. Intensive
vegetables on "shipped up" soil. Smoke
stacks are from glasshouse heating plants.



E-1010 August 11, 1950
Holland, West Massachusetts. Protected sand
dunes, serving as dikes.

Normally, farm families start with vegetables, then go to cold frames, and finally have glasshouses.

Soil surveys in this area are greatly needed and must be made in extreme detail, since success in the glasshouse depends upon having a soil that is deep and friable. In this place, sand was taken from many thousands of hectares of sand dunes and barged into the low clay area and used as a deep covering. In this way the Dutch made good horticultural soils from two poor ones. The practice began in the 17th century and was continued up to World War I. Besides, manure from cattle grazed on the peat land was transported by canal to these soils. After World War I, labor became too expensive to move these great volumes of sand. Then too, it was necessary to leave some of the dunes to protect a source of potable water.

After World War I, many new horticultural farms were started on the lower-lying clayey soils. Many of these are quite sticky, even though relatively low in clay content, and thus difficult to drain. During the last war, the Germans built anti-tank barriers on some of the better soils and the displaced gardens were relocated on soils with sticky B horizons not suitable to horticulture. Some of these may be considerably improved by tile drainage, even enough for glasshouses, whereas others can only be improved for growing vegetables out-of-doors.

I examine hurriedly profile c (page 98 of the Guide) and photograph it. This is considered a good soil for horticulture,

although not an artificial one. The water table can be controlled between 1 and 1.2 meters beneath the surface. Peaches are grown in the glasshouse and vegetables outside. I see a little tobacco -- a remnant of World War II.

A _p	0-9"	Dark grayish-brown fine sandy loam.
B	9-20"	Brown fine sandy loam.
G ₁	20" +	Lighter grayish-brown light fine sandy loam, finely mottled with dark reddish-brown.

Then I look at profile 2a, page 97 of the Guide, which is said to be hard to improve with tile drainage. The soil is finer in texture and the structure is not so good.

A _p	0-7"	Dark brown heavy silt loam.
B	7-15"	Grayish-brown sticky fine sandy clay loam.
G ₁	15" +	Grayish-brown fine sandy clay loam, mottled with reddish-brown. The water table stands at a bit less than 1 meter.

I look at another profile intermediate between these two that is used for crops under glass with tile drains at about 70 centimeters when used for grapes and peaches. For good yields of other crops, tile drains are needed. Recent experiments have shown a doubling of yield from such drainage.

Here horticulturists use per hectare up to 350 kilos of N, 250 of P₂O₅, and 400 of K₂O.

The interest in getting soil maps is so great in relation to the facilities of the Soil Survey that arrangements are made

for farmers to have soil maps of their holdings, with interpretations, for a fee of 50 to 150 guilders.

During the summer, soils under glass get dry and sometimes salty from the slightly brackish water and from the fertilizers. Thus, they need very heavy watering in the autumn.

I go into a glasshouse. It was unfortunately built partly over the poor soil. Here the peaches are poor. I see some magnesium deficiency, which is said to be normal. I am told that on the intermediate soil the deficiency symptoms disappear after proper drainage.

(It should be remarked somewhere that the deficiency symptoms one sees on the horticultural crops must not be taken as evidence of low soil fertility, but rather as evidence of unbalance in a very intensive system of management involving the use of large amounts of fertilizer and organic matter.)

I then go on to an area of the so-called "shipped-up" soil -- soil made in previous centuries by the spreading of transported sand from the dunes. (Profile d, page 98 of the Guide.) Here table grapes are the main crop, although there are many other fruits and vegetables, partly in the open and partly under glass, both cold frames and glasshouses. Just here, it appears that more crops are under glasshouses than in the open.

A _p	0-23"	Very dark brown fine sandy loam, added as dune sand and mud from the ditches.
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A_{pb} 23" + Grayish-brown fine sandy clay loam or clay, with the water table controlled at 1 meter.

I am told that a farmer here has an investment of around 200,000 to 300,000 guilders per hectare with about one-half of the land under glass.

Then I am taken to see grapes in a glasshouse unfortunately built on a wet "sticky" soil. (Profile e, page 98 of the Guide.) The grapes show poor rooting, with only large roots in the upper 18 inches. The grower has used a great deal of organic matter, including peat, to improve the upper 12 inches of soil. The dry surface even now shows some salt. Yet even with all this organic matter, soil structure is not so good as required for high yields. The water table is at 1 meter, but is hard to control precisely. The grapes have only a small percentage of new shoots. This is in contrast to a glasshouse where grapes are growing well -- where essentially no sunlight comes through the dense foliage. The grapes themselves are irregular in shape.

We now go to lunch, and my guides suggest some of the limiting factors for horticulture in the Westland:

1. Disease control is a major problem, because of the compactness of the area and the intensity of use. Frequently it is necessary to sterilize the soil.

2. Salinization of soil by abundant fertilizer use under glass and by the slightly brackish ditch water that must be used

for irrigation. Some salt water comes into the ground water from the sea. This problem is worse in summer and on soils with sticky subsoils.

3. Waterlogging, especially of the clays and silty clays. Recently tile drainage schemes have been worked out that are beneficial on many types of soil, but not on the worst ones.

4. Lack of good soil. There is no soil left on which horticulture can expand, and the cities threaten to crowd out farmers on the good soil. (This conflict between cities and agriculture is very important throughout Western Europe, and perhaps especially so in Holland. The soil survey has been the most useful and effective way of guiding city expansion away from soils well-suited to agriculture.)

We drive to a place near The Hague and look hurriedly at a soil from dune sand. (Profile 3, page 99 of the Guide.) Some two to three feet of dark gray light loamy fine sand lie over gray, wet, fine sand. This area was originally dune sand; but the upper part was removed so that the water table could be controlled at about 60 centimeters continuously. Large amounts of manure have been worked into the upper two feet. Vegetables and fruits are grown both in the open and under glass. This area is now nearly surrounded by the suburban building from the city.

In contrast to yesterday, we are having a beautiful day for this trip. We go on southwest on the old Roman road, with sand

dunes to the left from which drinking water is taken, and then to an area of recently dug out dunes of this century. Here the sand has been excavated for industrial uses for about 4 or 5 meters to leave soil suitable for horticulture. They went just a bit too far and have the water table at about 40 to 50 centimeters instead of 60. About one-half of it is used under glass.

We take a short walk down to the sea over the protective dunes, which act as dikes. Here stone breakers built at right angles to the shore extend many meters out to the sea in order to prevent erosion by the sea. The dunes here are no more than adequate for protection, and, if cut away by the surf, should need to be replaced with expensive dikes.

We look at another soil profile within a glasshouse used for grapes. This one is simply gray to pale brown calcareous fine dune sand. Not much organic manure is used. Roots are exceedingly well developed down to the water table, which is controlled at one meter. Large amounts of chemical fertilizer are used. Here the lower soil receives salt-free seepage water from the high dunes. Grapes are excellent. Here the farmer is very close to having a sand culture. The grapes yield 150 kg. per 40 sq. meters, of which 28 are under glass and 12 outside the glass (that is, feeding roots extend outside the walls of the glasshouse).

The tour is a bit behind schedule, so we stop only for a few moments at the horticultural station and look at their laboratories and some of their arrangements for experimenting with crops.

I am back to the hotel at 6:30, very tired. After dinner and a bit of chit-chat, I am to bed early.

Mechanical and chemical composition of soil profile samples.

Excursion Breda VIII, Westland, excursion point 2a, wet sandy clay soil.

Layer of sample	pH	CaCO ₃ cont.	Humus cent.	Fract. of the tot.s. in perc..			Fract. of the min. part of the sample in perc.				M	P (H ₂ O extr.) p.p.m.	P (citr.ac. extr.) p.p.m.	Kali %	K number 1)
				0-16	16-105	>105	<2	2-50	50-200	>200					
0-18	7.3	3.6	6,5	48	40.5	11.5	31	52	14	3	18	40	560	370	
40-60	7.8	10.4	1.3	54.5	42	3.5	34	59.5	5.5	1	12	10	230	200	
92 +	7.7	16.5	1.3	57	42	sp	37	62	1	sp	10	10	450	120	

Excursion Breda VIII, Westland, excursion point 2b, moist sandy clay soil.

40-60	7.8	9.5	0.9	29.5	49	21.5	19	40.5	39	1.5	43	10	80	100	
60-75	7.8	10.6	0.7	26.5	51.5	22	13	48	37	2	44	0	90	90	
75-82	7.8	9.3	0.8	33.5	56	10.5	20	48.5	31	0.5	40	10	100	100	
88 +	7.6	11.5	0.9	56	42.5	1.5	34	62	4	sp	12	10	120	130	

Excursion Breda VIII, Westland, excursion point 2c, moisture containing sandy clay soil.

0-25	7.2	2.3	5	29	42.5	28.5	16	35.5	45	3.5	48	30	340	250	
66-82	8.0	10.5	0.8	22	45.5	32.5	13	30.5	55	1.5	65	10	110	60	
82-100	8.0	11.6	0.6	15.5	51	33.5	9	29.5	60.5	1	75	10	90	50	
100 +	7.8	13.2	0.6	26.5	51	22.5	17	37	45	1	47	0	110	50	

Excursion Breda VIII, Westland, excursion point 2d, shipped-up soil.

20-50	7.1	1.8	3	12	14.5	73.5	7	16	55.5	21.5	165	60	1500		36
82 +	7.6	7.7	1.7	38	45.5	16.5	24	51	20.5	4.5	29	30	480	130	

1) Conventional Dutch number calculated in humus base.

Mechanical and chemical composition of soil profile samples.

Excursion Breda VIII, Westland, excursion point 2e, wet sandy clay soil.

		Fract.of the tot.s.in perc.		Fract. of the min.part of the sample in perc.												
Layer of sample	pH	CaCo3 cont.	Humus cont.	Dutch scheme			American scheme				M	P (H2O extr.) p.p.m.	P (citr.ac. extr.) p.p.m.	Kali %	K number 1)	
				0-16	16-105	>105	<2	2-50	50-200	>200						
0-20	6.1	0.29	9	42	32.5	25.5	26	45	20.5	8.5	24	180	1350	930		
63-75	7.7	9.5	1.8	59.5	39	2.4	40	51.5	8	0.4	8	10	140	480		
75 +	7.8	7.3	1.6	59.5	39.5	1.1	37	58.5	4.2	0.4	9	0	130	410		

Excursion Breda VIII, Westland, excursion point 3, black dune sand soil.

0-32	6.6	0.14	4.5	4	3.7	92.5	2	4.2	69.5	25	175	250	1790			79
51-62	7.2	0.48	3.5	2	3.6	94.5	0.5	3.5	72.5	23.5	175	130	1090			82
62 +	7.3	6.0	0.2	0	0.6	99.5	1	0.3	21.8	78	180	50	260	120		

Excursion Breda VIII, Westland, excursion point 5, dune sand soil.

0-28	6.9	0.91	1	2.6	2.6	94.8	2	2.3	66	29.7	180	120	1300	140		
65-80	7.5	1.4	0.5	1.2	2.2	96.6	0.5	1.5	51.5	46.5	205	40	480	90		
95-105	7.6	6.6	0.1	0.2	2.5	97.3	0.1	2	49.5	48.5	205	40	380	90		

1) Conventional Dutch number calculated in humus base.

August 12

This morning Mommy stays back at the hotel in order to take the train to Amsterdam and the plane to London. I go out on the last of the Holland tours into the region of sandy soils near Breda (page 101 et seq of the Guide).

We stop for a moment near Breda at a 400-hectare forest of nice beeches and oaks. This land could be used as arable land, since the cover sands^{1/} are somewhat loamy. This sandy plain near Breda is undulating. Generally the higher parts are used for arable land and the lower ones for pasture, except a few very low ones that are swampy. Here again, the water table is of prime importance. Normally, the water falling as rain alone is not enough for good crops. I am told that generally the cover sands are 2 to 5 meters deep.

At our first stop (page 103 of the Guide), we look at a relatively dry sandy heather Podzol^{2/} with rather poor maize. Asparagus does better.

1/ The expression "cover sands" is used for wind-laid sands of the Pleistocene period. They cover quite a bit of the lowlands of Holland and Belgium fairly evenly. Beyond these cover sands, where the land rises in Belgium, loess was deposited.

2/ Added later: Prof. Dr. Tavernier tells me that it is the accepted view of himself and other pedologists that a large part of these Podzols in southern Holland and in Belgium are primarily man-made. It is believed that originally the land had poor forest, mainly oak and birch, which was destroyed in order to graze sheep. Small fields were put into a high state of productivity through the use of large amounts of manure, often composted with soil-containing leaf mold from the forest and later with heather sod. But it is thought that the big sheep ranges deteriorated in productivity and were invaded with heather, and that this heather gave rise to the common Podzols now seen. It is suggested that only 500 to 1000 years may be required to produce a heather Podzol under these conditions.

The surface A_p of 6 to 8 inches is dark grayish-brown loose loamy fine sand. This is underlain with a gray fine sandy A_2 about 5 to 6 inches thick that gives way in turn to an irregular orterde about 4 to 8 inches thick. The material beneath is pale yellow sand.

I try to get some pictures here, but have quite a bit of difficulty with my camera and in finding a proper place. In the forward slope of the field, where we are shown the profile, the A_p has been reduced to about 2 inches in thickness. It is said that the water table is at 1 to $1\frac{1}{2}$ meters in summer. It seems deeper to me. I suspect that this example lies somewhat higher above the water table than most of the soil. At least, the typical soil should have some evidence of gleying at 50 to 70 centimeters.

Farming here does not look to be very prosperous. About one-half of the land is in grass and about one-half arable. Farmers sell milk, pork, eggs, and vegetables. Cereals, mostly rye with some oats and barley, account for about 55 percent of the crops. Perhaps 20 percent is potatoes and 20 percent vegetables. Besides, there are some lupines, beans, and the like. Annually, farmers use per hectare 60 to 70 kilos of N, 50 to 60 of P_2O_5 , and about 100 of K_2O . Besides, they use manure on the arable land. Fertilizer rates are higher on the vegetable crops and lower on the cereals than these average figures.



K-1911 August 12, 1950
Holland. Near Breda. Profile of dry heather
Podzol (slope reduces A_p from 6" to 2").



K-1912 August 12, 1950
Holland. Near Breda. Asparagus and poor
maize on dry heather Podzol.

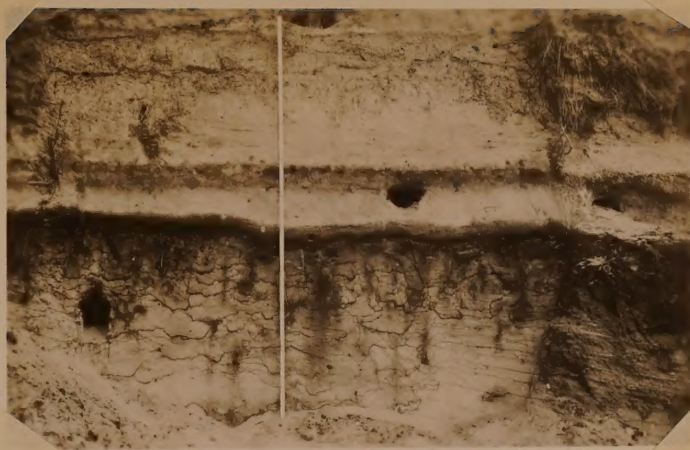
We drive on for a ways and stop in a dry place where the soil is unused. The sandy soil looks much like the last one, but is higher above the water table. Generally, the drier sites are in forest and the low places between the dunes have fruits and vegetables. I see a fossil heather Podzol said to have been formed probably between 5000 and 2000 B.C., according to a study of the pollen grains. Later it was covered. Although perhaps most of the heather Podzols are relatively recent, this excavation suggests that there were some very old ones.

A little further away is a buried peaty Podzol, originally in a low place and then covered with sand. The peat has shrunk into hard, light (in weight), nearly black, medium blocks. The peat is covered with about 8 feet of sand. I photograph this cut where the various layers of cover sand are exposed. The lower ones, directly above the peat, are prominently gleyed. It is said that water moves through the peat only very slowly, and thus gets concentrated in the sand just above it. The vegetation about here is mainly heather.

I then drive on to Bergen op Zoom.

The first profile (a, page 104 of the Guide) looks to me about as follows:

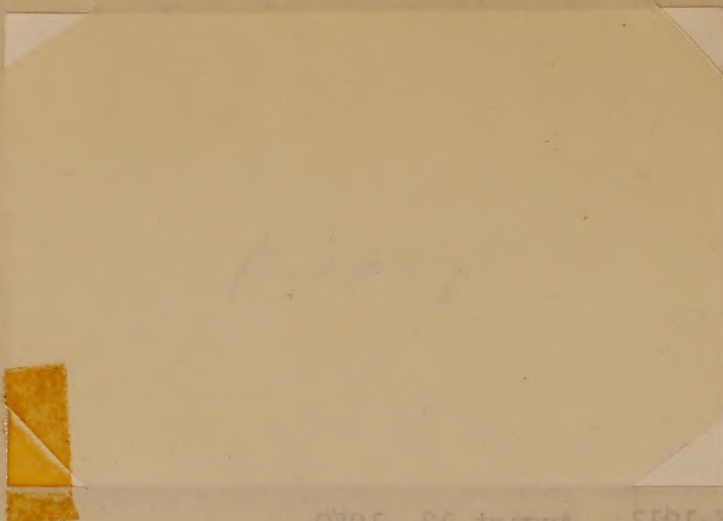
A _p	0-22"	Grayish-brown light loamy fine sand.
A ₃	22-25"	Yellow fine sand.
B ₁	25-34"	Black fine sand.



K-1913 August 12, 1950
Holland. East of Bergen op Zoom. Fossil
heather Podzol buried by about 25 inches of
wind-blown sand. The underlying soil, with
distinct A_1 and B_2 , probably formed between
2000 to 5000 B.C.



K-1914 August 12, 1950
Holland. Near Bergen op Zoom. Peaty Podzol
covered with various layers of cover sand, the
lower ones of which are gleyed. About 6 feet
cover the old soil.



K-1913 August 12, 1950
Holland. East of Bergen Co. Road. Fossil
Heather Pothol buried by about 25 inches of
wind-blown sand. The underlying soil, with
distinct A₁ and B₂, probably formed between
2000 to 5000 B.C.



K-1914 August 12, 1950
Holland. Near Bergen Co. Road. Fossil Pothol
covered with various layers of cover sand, the
lower ones of which are gleyed. About 6 feet
cover the old soil.

G _b	34-45"	White fine sand.
B _{3b}	45" +	Grayish-brown and very dark brown fine sand, coarsely mottled.

The water table appears to be more than $1\frac{1}{2}$ meters deep.

This old garden soil seems to be fairly well suited to asparagus grown in rotation with rye. The soil is worked deeply in trenches. The asparagus does well for about 7 or 8 years, but will not grow well again. The reasons why it cannot be repeated for good yields are not known. The crop has only been grown in this area for about 50 years and may have to be discontinued.

I then look at the profile (b, page 104 of the Guide) of a moist, sandy, humus-rich garden soil adapted to a wide range of crops, with a water table at about 40 to 60 centimeters.

A _p	0-14"	Dark gray loamy fine sand.
A _{2gb}	14-23"	Light gray loamy fine sand.
B _{2b}	23-28"	Very dark brown orterde.
B _{3b}	28-39"	Brown transitional soil.
C-G	39-45"+	Very pale yellow silty very fine sandy loam, compact in place.

The old soil was covered long ago, and at one time the water table was higher. Since the water table is so important, evidences of gleying are widely used in classification and mapping.

I see growing here many vegetables and small fruits, including cabbage, rhubarb, lettuce, strawberries, tomatoes, peas, beans, and leeks.



K-1915 August 12, 1950
Holland. Near Bergen op Zoom. Standing on
moist, humus-rich, low, sandy soil and looking
toward somewhat higher land. Intensive
horticulture.



K-1916 August 12, 1950
Holland. Near Overa. Oat harvest on old
sandy crop land.

I look hastily at a somewhat higher-lying soil (c, page 104 of the Guide):

A _p	0-21"	Very dark gray to nearly black light fine sandy loam.
A _{1b}	21-25" <u>+</u>	Nearly black loamy fine sand of the old heather Podzol.
A _{2gb}	25 ₊ -30"	Gray loamy sand.
C _g	30" <u>+</u>	Dark brown sandy soil.

Here too, the soil map is being used to guide urban development onto the high sandy soils and away from the arable land. In Breda the plan for the town is being revised, but in Bergen op Zoom the town plan still calls for unnecessary building on arable land.

I try for a photograph showing these kinds of soil by standing on the last one used for parsnips, looking toward the intermediate one, with the highest one in the far background.

The leaves of fruit trees here show magnesium deficiency, probably aggravated by the calcium in the phosphorus and nitrogen fertilizers and the high use of potassium in places. Besides the magnesium deficiency, one sees evidences here and there of deficiencies of potassium, of iron, and of manganese.

After lunch in Breda, we go to look at horticultural soils on the loamy cover sands near Breda.

I describe the first profile as follows: (a, page 105 of the Guide.)

I look hastily at a somewhat higher-lying soil (c, page

101 of the Guide):

A _p	0-21"	Very dark gray to nearly black light fine sandy loam.
A _{1p}	21-25" ₊	Nearly black loamy fine sand of the old heather Podsol.
A _{2sp}	25 ₊ -30"	Gray loamy sand.
C ₂	30" ₊	Dark brown sandy soil.

Here too, the soil map is being used to guide urban develop-

ment onto the high sandy soils and away from the arable land. In

Breda the plan for the town is being revised, but in Bergen op Zoom

the town plan still calls for unnecessary building on arable land.

I try for a photograph showing these kinds of soil by standing

on the last one used for parsnips, looking toward the intermediate

one, with the highest one in the far background.

The leaves of fruit trees here show magnesium deficiency.

probably aggravated by the calcium in the phosphorus and nitrogen

fertilizers and the high use of potassium in places. Besides the

magnesium deficiency, one sees evidences here and there of defic-

iciencies of potassium, of iron, and of manganese.

After lunch in Breda, we go to look at horticultural soils

on the loamy cover sands near Breda.

I describe the first profile as follows: (a, page 102 of the

Guide.)

A _p	0-18"	Very dark grayish-brown fine sandy loam, rich in organic matter. The horizon has been built up partly through the long use of manure. It contains artifacts.
A _{1b}	18-30"	Dark brown very fine sandy loam (probably the A ₁ of an old cultivated forested soil).
B ₃	30-34"	Transitional.
C-G	34-40"	Gray fine sandy loam, coarsely mottled with yellowish-red.

The upper soil contains many earthworms. The soil is firm in place, especially in the lower part. I suspect that the upper part is mostly the fine loamy cover sand, and manuring has not contributed very much mineral material. This seems to be suggested too from the mechanical analyses. The soil is used for vegetables and fruits out-of-doors, under low glass, and in glasshouses.

We then look at a more moist arable soil (b, page 105 of the Guide). The surface soil is somewhat darker and gleying is a bit closer. This one is used for vegetables and small fruits and partly for cereals and grasses.

In soil mapping here it is important to be able to distinguish between the "active" gleying in the soils and the "fossil" gley resulting from former high water tables.

We drive by an old soil that had been heavily manured and used for grass. It is a deep, nearly black fine sandy loam at the surface, becoming fine sandy clay, and finally peat beneath. The soil is finely and intensely mottled with "rusty brown." When

dry, the soil is medium to dark gray. Our Guide says that this bright reddish-brown mottling in the surface indicates that this would be a good soil during winter! It is used as grassland and, when drained, also some for horticulture. In early times it received large applications of compost containing manure and earth.

Here, I am told, three crops of chicory can be grown in succession; but after that chicory cannot be grown again unless the soil is sterilized with steam or used for leeks.

We go on directly to somewhat similar alluvial soil (6, page 106 of the Guide), but the sandy manure has not been used. This area has been used for hay for a long time and is occasionally flooded by the stream. I should call it an intergrade between Alluvial and Humic-Gley.

A ₁	0-2"	Dark gray fine sandy loam, rich in organic matter.
A ₃	2-11"	Medium to dark gray fine sandy loam, beautifully and strongly mottled (almost lacy) with reddish-brown. There are some small fine reddish-brown concretions said to be mainly Fe ₂ O ₃ .
A _{3g}	11-14"	Grayish-brown, sticky, fine sandy clay loam.
C-G	14-25" +	Medium to light gray loamy fine sand to fine sandy loam.

The surface has the characteristic microrelief of the first terrace of a post-mature stream with many meanders.

We drive on hurriedly for the last demonstration of the day near Overa (7, page 106 of the Guide). Apparently this soil has become more well drained over the years, and is now too dry for the best crops. This is another example of a soil built up by earth-containing manure or compost -- probably at least two feet.

One sees in the A_p many of the white sand grains from the surface soil of the heather Podzol.

A_p	0-26"	Medium to dark gray loamy fine sand. In the lower part are evidences of the old A_1 of the heather Podzol.
G_b	26-43"	Pale yellow fine sand mottled with gray (active gley) and strong bright brown, almost ortstein (fossil gley). This gradually changes to:
G	43-73"+	Gray, wet, slightly loamy fine sand. Compact. Active gley.

While the others argue and fuss over this profile, I try hard for a picture of the oat harvest on the other part of the field.

We are back at the hotel about 5:00, with the Holland tour over. Certainly it has been most excellently planned and arranged. Since Mommy is now on her way to London, Prof. Dr. Edelman occupies the other bed in my room. We have much chit-chat and finally go to bed about 10:15.

Mechanical and chemical composition of soil profile samples.

Excursion: Breda IX, Brabant sandy soils, excursion point 1, Heerlese heide. Medium high heath -soil on local coversand.

		Fractions of the tot.s. in perc.		Fract. of the min.part of the sample in perc.							<i>K number</i>		
Layer of sample	pH	CaCo3 content	Humus content	Dutch scheme			American scheme				P (H2O extr.) p.p.m.	P (citr.ac. extr.) p.p.m.	K2O (0.1.n. H.C.l. extr.) p.p.m.
				0-16	16-105	>105	<2	2-50	50-200	> 200			
0- 20	5.9		3,5	3.8	27	69.2	0.3	15.5	55	19.2	20	350	44
20- 35	5.3		2,5	5	24.5	70.5	-	15.5	54	30.5			
35- 55	5.0		2.5	5.2	24	70.8	2	14.2	52	31.8			
55- 75	5.0		0,5	1.8	14.9	83.3	-	3.7	62	34.3			
75->100	5.0		0,5	2	15.8	82.2	0.2	4.6	67	28.2			

Excursion point 2, sand pit east of Bergen op Zoom, blown sand on cover sand, separated by a fossile vegetation profile.

4.9	1,5	2,5	19.1	78.4	1	3.6	72	23.4	<i>green</i>
4.7	1.7	1.5	15	83.5	-	3.5	74	22.5	<i>A</i>
4.7	2.0	0.8	16.5	72.7	0.5	2.8	76	20.7	<i>B</i>
5.0	0.8	1.2	28	70.8	1	5.2	77	16.8	<i>C</i>

Excursion point 3a, Bergen op Zoom, old horticultural soils, very moist, humous, old garden-ground.

0- 30	6.5	0.04	8	7.2	25	67.8	4.5	8.7	68	18.8
45- 48	6.3		14	8.2	38.5	53.3	4.5	11.2	73	11.3
55- 75	6.3		3.5	4	35.5	60.5	2	7.5	78	12.5
75-100	5.8		2	8.5	38	53.5	6	7.5	85.5	1
	6.7	0.04	6.5							

40

370

20

if conventional Dutch number, calculated on humus base

Mechanical and chemical composition of soil profile samples.

Excursion: Breda IX, Brabant sandy soils, excursion point 3b, Bergen op Zoom, old horticultural soils, moist, humous, old garden-ground.

												moist, humous, old garden-ground.		
		Fractions of the tot.s.in perc.		Fract. of the min.part of the sample in perc.										
Layer of sample	pH	CaCo3 content	Humus content	Dutch scheme			American scheme				P (H2O extr.) p.p.m.	P (citr. ac. extr.) p.p.m.	K20 (0.1.n. H.C.l. extr.) p.p.m.	
				0-16	16-105	>105	<2	2-50	50-200	>200				
0- 30	6.8	0.03	4.5	6	20.5	73.5	3.5	5	69	22.5				
5-60	6.2		1	1	20	79	0.3	4.2	67.5	28				
0- 75	6.1		2.5	3	17	80	1.5	3.5	63	32				
5- 85	5.6		2	1.4	18	80.6	0.5	4.9	53	42.6				
0-100	5.6		1.4	14	30	56	11	7.5	68	13.5				
	6.3		5								120	550	45	

Excursion point 3c, Bergen op Zoom, old horticultural soils, dry blown sand soil.

0- 30	6.2		2	2.6	19.2	78.2	2	4.3	65.5	28.2			
5- 65	6.2		1	2.7	20.7	76.6	2	4.9	63.5	29.6			
5- 80	5.7		8	5.5	17.3	77.2	3	6.3	45.5	45.2			
0-100	6.0		0.5	0.2	6.5	93.3	-	2.7	30	27.3			
	6.6	0.04	2								80	550	50

conventional Dutch number, calculation on humus base

August 13

I am up early in a cool, rainy morning and pack for the trip to Ghent. The bus leaves about 8:30, but I wait with Prof. Dr. Edelman to go in a car with Prof. Dr. Tavernier. It clears, and we leave about 9:00 on the road to Antwerp. We have a short wait at the frontier and then go to a reception in the city hall at Antwerp. It is arranged that we shall take turns answering the "pretty speeches." I have this one. I say a few words about the smoothness of transition from Holland to Belgium and "how impressed I am that the Council of such a large seaport city appreciates the importance of soil, which is, of course, the basis of all life and trade. Then too, we are glad to be received in this beautiful city hall because we in America need to be reminded how deep are our roots in Europe, and that the principles of the democracy of which we are so proud, and yet often take for granted, were worked out in places like this in blood as well as in debate."

Then we go to lunch at Rivierenhof, near the edge of Antwerp. The lunch is excellent and said to be American. The people who arranged it (they are sitting by me, but I can't speak Flemish and they don't speak English) called the American Consul and he told them what would be an American lunch.

Afterward, we drive to Brussels, first over the cover sands and then over the transition to loess. Here we are first received

in the Palace of the Academies and listen to a short talk of welcome by the Belgian Minister of Agriculture. It rains hard for a few minutes. We make our way to the beautiful city hall of Brussels and have a speech by the senior alderman, a lady, who does it well in Flemish, French, English, and Italian. Then, of course, her speech has to be answered. We are shown around the city hall here as we were in Antwerp, and time passes.

I get to my hotel in Ghent about 8:00 and then to dinner about 9:00! Then I am told there is to be a movie after the dinner! It is at times like these that I could use more patience. But Tavernier kindly takes me back to my hotel after dinner, and I get to bed about 10:00, very tired and, I am afraid, a little cross.

TUESDAY - August 15th

Members of both groups will be provided with a lunch basket.

First Group

- 9.00 a.m. Leave Hotel by bus for excursion to Alost Land
- 12.30 p.m. Lunch at the Agricultural School at St.Nicolas
- 2.00 p.m. Excursion to Waasland
- 5.00 p.m. Departure for Louvain
- 7.00 p.m. Dinner and hotel accomodation at Louvain

Second Group

- 9.00 a.m. Leave Hotel by bus for tour of Ghent district
- 1.00 p.m. Lunch at Aalst
- 2.30 p.m. Tour of Aalst district
- 5.00 p.m. Departure for Louvain
- 6.30 p.m. Dinner and hotel accomodation at Louvain

Mailing address: "Bodemkundig Station",
Kardinaal Mercierlaan, Heverlee

WEDNESDAY - August 16th

- 9.30 a.m. Visit to Meerdaal Forest to see beetroot experimental fields on loamsoils at Nodebais and agricultural land at Beauvechain which until recently was forest area.
- 1.00 p.m. Lunch in the vicinity of Landen
- 2.30 p.m. Proceed to the slightly hilly loam district near Neerlanden. Stop at an observation point overlooking the sandy loam area.
- 7.00 p.m. Dinner at Louvain at the "Collegium Justii Lipsii"

THURSDAY - August 17th

- 9.00 a.m. Leave by bus for St.Trond.
Study of the relationship between the growth of fruit trees under various soil conditons
- 12.30 p.m. Lunch at the "Plimic Fons" at Tongres and visit Roman ruins
- 2.00 p.m. Departure for the Meuse terrace landscape (via the "Albert Canal" and through the Meuse Valley) and on to "Pays d'Herve"
- 7.00 p.m. Arrival at Liege - accomodation arranged in Hotel

FRIDAY - August 18th

- 8.30 a.m. Leave by bus for St.Nicolas -
Excursion South of the Meuse in the Ardenne
Condrusienne. (Visit to the U.S. Military
Cemetery Neuville-en-Condroz)
- 12.30 p.m. Lunch at Abée-Scry at the provincial Agricul-
tural School
- tour of the school
- excursion through Condroz - visit to a
typical farm

- 5.00 p.m. Arrival at Namur
Reception given by the City Council at the
"Maison de Croy"

Overnight at various hotels

Mailing address: Hotel Porte de Fer,
Avenue de la Gare, Namur

SATURDAY - August 19th

- 8.30 a.m. Leave for visit to Domaine de Marche-les-Dames
- 12.30 p.m. Lunch at Hotel St.Aubain, Namur
Reception given by the provincial authorities
- 3.00 p.m. Departure for Brussels stopping for a short time
at the State agricultural College, Gembloux

Participants who would like accomodation in Brussels for
the night of August 19th should hand in their names to
the Organizing Committee of the Congress.



August 14

This morning I am to have only a very light "French" breakfast, so I hurry out and get a supplement of oranges and hazelnuts. I am taken to the City Agricultural Institute of the University of Ghent. Here we have speeches of welcome by the Rector of the Institute, Prof. Dr. J. Van de Brande, and by Prof. L. De Leenheer. De Leenheer stresses the new soil mapping program and discusses the relation of the laboratory work to classification and something about the application of the work.

I make a very short visit to the Geological Institute with Prof. Dr. Tavernier. He shows me some excellent photographs of the effects of peri-glacial ice wedges and promises to send me some copies.

Then again we must hurry to a reception in the town hall. I wasn't supposed to be required to say anything here, but after the welcoming speech, the master of ceremonies nudges me to go ahead. About three minutes after I have finished, I remember the Treaty of Ghent! Then, from the hall we go to the cathedral to see the famous painting of the Adoration of the Lamb, so it is nearly noon before we start for the field.

We look at a rather sandy soil near Laarne (page 17 of the Guide).

A _p	0-16"	Brown loamy fine sand. Soft friable crumb structure. Earthy material has been added in manure.
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August 11

This morning I am to have only a very light "france" breakfast, so I hurry out and get a supplement of oranges and bananas. I am taken to the City Agricultural Institute of the University of Ghent. Here we have speeches of welcome by the Rector of the Institute, Prof. Dr. J. Van de Brande, and by Prof. L. De Laender. De Laender stresses the new soil mapping program and discusses the relation of the laboratory work to classification and something about the application of the work. I make a very short visit to the Geological Institute with Prof. Dr. Tavernier. He shows me some excellent photographs of the effects of periglacial ice wedges and promises to send me some copies.

Then again we must hurry to a reception in the town hall. I wasn't supposed to be required to say anything here, but after the welcoming speech, the master of ceremonies urges me to go ahead. About three minutes after I have finished, I remember the Treaty of Ghent! Then, from the hall we go to the cathedral to see the famous painting of the Adoration of the Lamb, so it is nearly noon before we start for the field.

We look at a rather sandy soil near Lamine (page 17 of the

Guide).

Brown loamy fine sand. Soft friable crumb structure. Earthy material has been added in manner.

0-16"

A_p



K-1917 August 14, 1950
Belgium. Ghent. Soil survey drafting room
at University.

A _{1b}	16-18"	Very dark gray to black loamy fine sand of variable thickness.
A _{2b}	18-20"	Light to medium gray loamy sand with tongues to 28 inches.
B _{2b}	20-30"	Very dark brown loamy sand with bits of ortstein. Tongues go deeply.
G _{1b}	30-48"+	Pale yellow, moist, fine sand mottled and streaked with reddish-yellow (mostly fossil).

Here we see little fields rounded from the edges to the center. They are about one-half to one acre in size, and the centers are 2 to 3 feet higher than the margins. This has resulted from the old Medieval practice of spading to the center. Mud was thrown out of ditches and a great deal of manure used, but the rounding is due more to this long-continued spading to the center than to additions of mineral matter in the manure.

We then look at the profile of a so-called "colluvial" soil (b, page 18 of the Guide). This soil might have been somewhat similar to the last one at one time, but the upper 16 inches has resulted from local surface accumulation together with perhaps some mineral matter from manure. The soil has active gley at 40 inches. I have no doubt that this soil was deeply dug and mixed before the upper 16 inches were added.

It rains. We look hurriedly at a soil near Melle-Kouter (a, page 18 of the Guide), which I should call a rather weakly developed sandy Gray-Brown Podzolic soil.



K-1918 August 14, 1950
Belgium. Near Ghent. Soil profile 1a in Ghent
Guide. Sandy soil in the "rounded fields"
originally a heather Podzol. Fossil gley below
B_{2b}.



K-1919 August 14, 1950
Belgium. Near Ghent. Rounded field (heather
Podzol originally).



K-1920 August 14, 1950
Belgium. Near Ghent. Landscape on weakly developed
sandy Gray-Brown Podzolic. Oats and sugarbeets.

We look at another soil nearby (b, page 19 of the Guide) that has a light very fine sandy loam surface, well-developed blocky structure in the B₂, and faint mottling in the C. This I regard as a good example of a weakly developed Gray-Brown Podzolic.

On the way back to Ghent, we stop at a horticultural farm that produces azaleas. These are grown on a deeply reworked, sandy, acid soil with some evidence of an old, weak heather Podzol in the lower part. I am disappointed that the nursery has none of the famous Ghent hybrid azaleas.

I am back at my hotel at 6:30 and attend a special dinner as the guest of the Rector of the Agricultural Institute of the University of Ghent, along with Ignatieff, Edelman, Tavernier, and a few others.



K-1921 August 14, 1950
Belgium. Near Ghent. Azalea nursery. Automatic
sprinkling of beds.



K-1922 August 14, 1950
Belgium. Near Ghent. Azalea nursery in the
greenhouse.

August 15

We leave about 9:00 on an excursion to the "Land of Aalst" (page 25 of the Guide) -- Tavernier, Bradfield, Edelman, and I in one car.

Tavernier tells me that if the Gray-Brown Podzolic soils are farmed, there is an increase in the tendency toward prismatic structure in the B horizon on the "loam" soils.^{1/}

Near Oordegem we look at a deposit of loess over Tertiary sand in a deep quarry. The covering varies from almost nothing on the northwest slopes to a thickness of several meters on the lower southeast slopes. This suggests that the winds came from the northwest out of the basin of the North Sea during the deposition of the loess. Here a Gray-Brown Podzolic soil has developed from the loess. The variations in depth greatly complicate soil mapping, since the adaptability of crops varies widely, depending on the depth to the sand material. For grape culture, for example, the sand should be fairly near the surface.

We drive on and look at a soil near De Berg on the flood plain of a small stream (a, page 28 of the Guide).

1. (A_p) 0-6" Brown silt loam.
2. 6-18" Mottled brown, reddish-brown, and gray silty clay loam.
3. (G) 18-24" Gray, sticky, silty clay.
4. 24-30"+ Dark brown silty peat, merging with depth into peat.

^{1/} Generally, in Belgium the soils developed from loess are called "lehm."



K-1923 August 15, 1950
Belgium. East of Ghent, near Oordegem. Sand
quarry showing Gray-Brown Podzolic soil.

Locally this is called a "colluvial" soil, but it is really one developing in narrow strips of local alluvium. Apparently the area was originally forested and, with the gradual erosion following clearing, has been buried. Thus it has been improved. In summer, the water table is at about 18 inches, and in winter is at the surface. The soil is now used mainly for pasture.

Nearby we look at another soil on a drier site -- a Gray-Brown Podzolic soil with some suggestion of Brown Forest (b, page 28 of the Guide).

A _p	0-7"	Dark yellowish-brown (10YR 4/4) very fine sandy loam. Softly granular.
A ₃	7-13"	Dark yellowish-brown (10YR 4/4) fine sandy loam. Friable, irregular subangular blocky structure.
B ₂	13-26"	Dark brown (appx. 7.5YR 4/4) fine sandy clay loam. Medium blocky and slightly prismatic; friable; vesicular. Well permeated with roots.
C	26-66"	Yellowish-brown (10YR 5/4) heavy very fine sandy loam to fine sandy clay loam. Coarse blocky to slightly prismatic, somewhat weaker than above. Somewhat vesicular. Roots are present. In depth this fades to:
D	66" +	Olive yellow fine sandy loam mottled with hues. Massive, but friable.

Several small, flattened, very well worn pebbles are in the solum. The soil is gently undulating and well drained. The soil has been very slightly truncated so that both the A₁ and the A₂ are included in the present A_p. Traces of roots are distinct. The soil is used for vegetables and small grains, but not much for fruit.

We now walk over to a slope of about 5 to 8 percent to see an imperfectly drained soil developed from heavy Tertiary clay.

A _p	0-5"	Grayish-brown silt loam, mottled with reddish-yellow and reddish-brown. Mixed granular and small blocky structure.
A ₃	5-10"	Grayish-brown heavy silt loam, mottled with reddish-brown. Friable. Angular blocky structure.
B _g	10-21"	Mottled grayish-brown, gray, and reddish-brown silty clay, with coarse angular nut structure. Plastic when wet.
C _g	21-30"+	Light olive-gray (5Y 6/2) heavy plastic clay with irregular coarse blocky structure when dry.

Perhaps this soil might be called a Low Humic-Gley. It is used some for potatoes, but is too difficult for general cultivation, and most of it is used for pasture and forest. I try some pictures here to bring all three of these soils into one photograph.

We then go to look at a fourth profile (d, page 30 of the Guide, and shown as 4 on the detailed soil map of the "Land of Aalst.") This appears to me to be a Gray Hydromorphic or Low Humic-Gley from wind-blown fine sand over Tertiary clay, which causes a perched water table. The soil was reclaimed in the 18th century. Although not very productive, it is used for pasture, cereals, and potatoes.

A _p	0-12"	Yellowish-brown light very fine sandy loam.
G ₁	12-38"	Mottled and streaked gray and reddish-yellow fine sandy loam with small black concretions. Friable, coarse angular blocky structure when only moist.
G ₂	28" +	Light olive-gray loamy fine sand, mottled and streaked with reddish-brown.



K-1924 August 15, 1950
Belgium. Near Meldert. Looking from Low Humic-
Gley on heavy sloping clay to Gray-Brown Podzolic.
Brown Podzolic transition at right.



K-1925 August 15, 1950
Belgium. Near Meldert. Looking from Low Humic-
Gley on sloping clay to alluvial soil.

TEMPORARY ADVISORY COMMITTEE
OF THE FOURTH INTERNATIONAL
CONGRESS OF SOIL SCIENCE.

NEW FOUNDATION
OF THE INTERNATIONAL SOCIETY
OF SOIL SCIENCE

*To the Members of the Fourth International
Congress of Soil Science:*

The second world-war totally dislocated the international relations between the soil scientists. Among several countries differences arose and these did not disappear together with the war. In reconstructing the international relations one has to consider this and for that reason the question is asked, if it would not be better to build a new foundation for the reconstruction of the International Society of Soil Science, that this may be done in the light of the new circumstances.

In this connection a meeting was held at Paris on May 22nd 1947, attended by soil scientists of several countries, belonging to the United Nations. It was decided that we should have a meeting at the next Congress of Soil Science to adopt a new constitution for an International Society of Soil Science and that the Congress at Amsterdam would decide freely about the organisation of the future Soil Science Society.

A Temporary Advisory Committee was constituted to prepare the necessary proposals and agenda for discussion and action in 1950. The minutes of the Paris meeting have been published in several soil science periodicals. The publication has not caused any

comment; so we are entitled to suppose everybody agrees with them.

Pursuant to the Paris decisions the Temporary Advisory Committee has taken the preparatory steps for the new foundation of the International Society of Soil Science. The foundation will take place on the last day of the Amsterdam Congress, Tuesday-afternoon August 1st. After the foundation the rules of the Society will be drawn up and the officials chosen.

The foundation naturally requires some preparation. In the first place the rules have to be drafted. Draft-rules will be handed to the members of the Congress on Monday-afternoon, July 24th, in the Hall of the Indisch Instituut (Mauritskade 63), where the inaugural session is to be held. Tuesday-afternoon, July 25th, these draft-rules will be discussed in a general meeting, to be held at 16.00 in one of the laboratories situated near the Roeterstraat. Here objections can be raised, and proposals put forward.

In order to work off the drafting of the rules with the necessary speed, it is not desirable that new objections are raised in the later stages of the discussions. So, if there are objections against part of the rules, these objections should be put forward on Tuesday-afternoon; after Tuesday-afternoon discussion is only possible on the objections, raised then. No decisions will be taken on Tuesday-afternoon; the discussion is only informative.

People, not convinced by the discussions on Tuesday-afternoon, can send in written proposals till Thursday-evening (directed to Ir W. R. Domingo, acting Secretary of the Temporary Advisory Committee, Reception Office Fourth International Congress of Soil Science, 126 Nieuwe Prinsengracht). A Committee *ad hoc*, appointed on Tuesday-afternoon, will discuss these proposals and make the necessary alterations. Only, if the alterations are fundamental, the new draft will be discussed on Sunday-evening, July 30th, in a general meeting. If, when and where this meeting will be held, will be communicated at the general meeting of Saturday-morning, July 29th, to be held in the Indisch Instituut.

The draft-rules will be printed anew on Monday, and handed to the members of the Congress on Tuesday-afternoon, August 1st, in the Hall of the Indisch Instituut, before the beginning of the foundation-session.

The foundation-session of the new Society will be presided over by the President of the Temporary Advisory Committee; all members of the Congress are expected to be present.

After the foundation of the Society and the establishment of the rules a number of officials will have to be chosen. Candidates will be nominated by the Temporary Advisory Committee (for the Commissions in concert with the Sections of the Congress). The list of the proposed candidates will be handed over, together with the draft-rules, before the beginning of the foundation-meeting. At the meeting other candidates may be proposed, but according to the rules, the President must be a resident of the country in which the next Congress is to be held.

The Congress has received a Belgian invitation to hold the next Congress in 1954 in the Belgian Congo. The Temporary Advisory Committee suggests to accept this invitation with thanks.

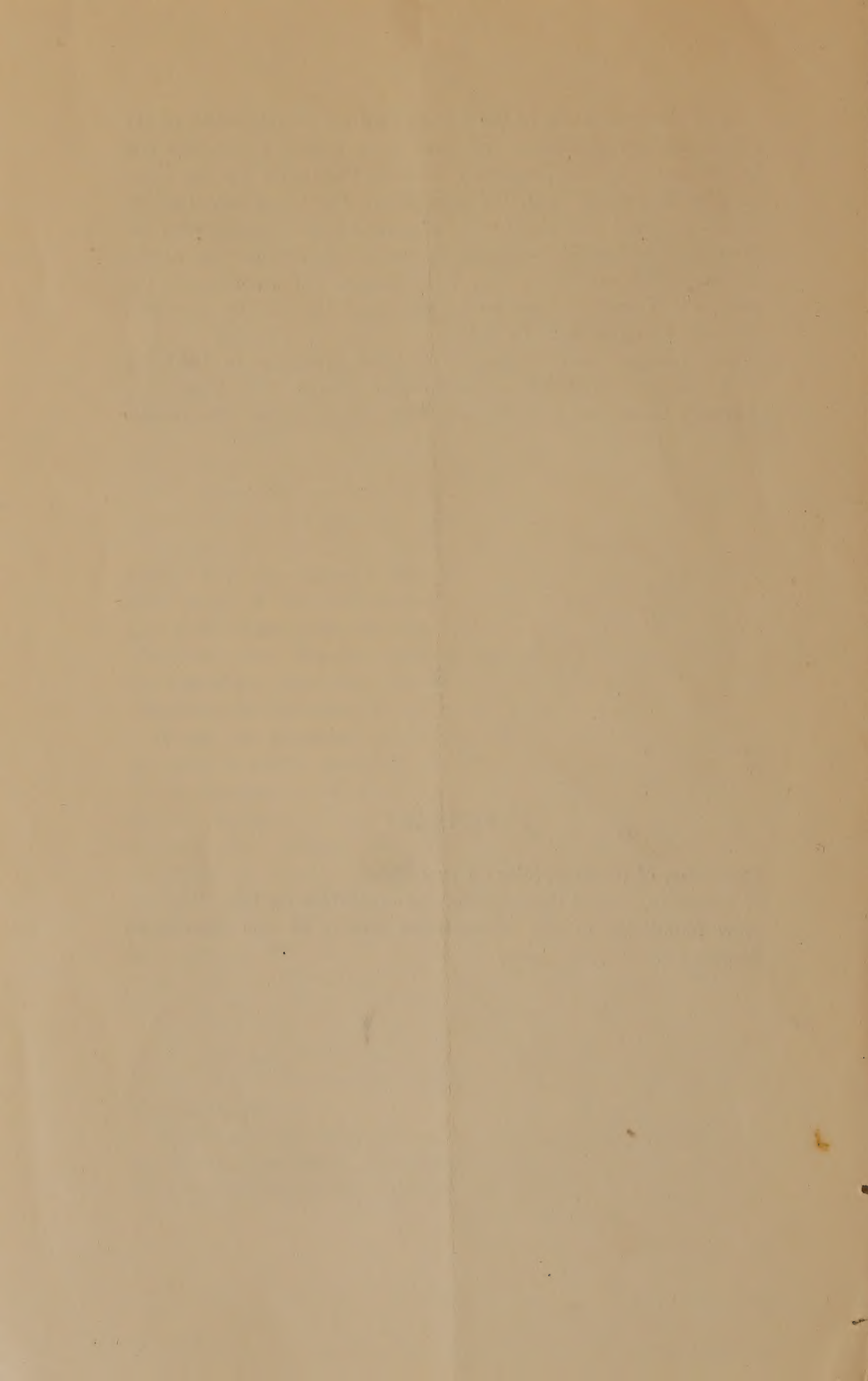


SUMMARY

Discussion of the draft-rules on July 25th.

If necessary, second discussion of the draft-rules on July 30th.

New foundation of the International Society of Soil Science on August 1st.



The material increases in clay content with depth to a fine sandy clay. Heavy clay is said to lie at 6 to 10 feet.

The surface is undulating and the soil is quite acid. The solum is developed from what might be regarded as very coarse loess underlain by Tertiary sand with Tertiary clay beneath.

This soil can be made productive only through drainage. Now the land is held in little fields and drainage can only be arranged cooperatively. It is possible that this can be done now. The problem had not been understood prior to making the detailed soil maps.

On the road to St. Nicolas we pass through an area with the rounded fields. These dome-shaped little fields probably date back to about the 12th century or even earlier. The centers are around 1 to 2 meters higher than the edges. I try to get some pictures along the margin of a new road.

After lunch at St. Nicolas, we then go to the "Land of Waas" (page 21 of the Guide).

We stop to look at a fine sandy grayish-brown soil over the Tertiary clay at about 1 meter (a, page 22 of the Guide).

A _p	0-11"	Grayish-brown loamy fine sand.
A _{2g}	11-17"	Gray to pale brown fine sand. Firm, but friable.
C _g (?)	17-40"	Mottled pale yellow, gray, and reddish-brown sand, with increasing clay in the lower part.
D _g	40" +	Mottled gray sandy clay.



K-1926 August 15, 1950
Belgium. Near St. Nicolas. New road showing profile of rounded
field caused by use. (Prof. Dr. Tavernier)

1936
K-1226 August 15, 1950
Belgium. Near St. Nicolas. New road showing profile of rounded
field caused by use. (Prof. Dr. Tavernier)

Likely the sand lying over the clay was blown up out of the river bottom. Further down the gentle slope we see a cultivated soil where the surface 8 to 10 inches is a fine sandy loam or heavier, made so by digging out the clay from beneath and mixing it into the plowed layer. The soil is used mainly for wheat and potatoes. The surface is gently undulating. I try to photograph the surface of a soil reclaimed about 1904 through this process of digging up the clay. It is said to have had an original cover of heather. Now it can be used for root crops for livestock, and wheat yields more than on untreated soil.

We then stop to look at the soils in the rounded fields near St. Pauwels (page 23 of the Guide).

Along the roads here one sees an extraordinarily interesting contrast between the tiny fields near the road and those back from the road. Apparently the contrast arose in this way: During the 14th and 15th centuries, the Count of Flanders required that strips of oak be planted and maintained along the roads. These were for his use and profit. Just back of these would be the ditch that made the margin of the first rounded field. These rights of the Count ended with the French Revolution and most of them were transferred to the villages. Now some of these little fields between that ditch and the present road are cleared and cultivated. The color of the soils in these tiny fields near the road have the



K-1927 August 15, 1950
Belgium. Land of Waas, near Ghent. Cultivated
field reclaimed about 1904 by digging out lower
clay to mix with sandy surface.

characteristic brown of the Gray-Brown Podzolic, whereas those back from the road have the characteristic dark gray of a well-manured heather Podzol. Even now there are many relicts of the forest along the road; that is, not all of the original forest has been cleared.

Where I first look at a profile in a rounded field, the soil appears to be a truncated heather Podzol overlain by 18 inches or so of brown sandy soil.

I look at a profile near the center of the rounded field (K 1928).

A _{p1}	0-10"	Soft, weakly granular, brown loamy fine sand.
A _{p2}	10-17"	Dark grayish-brown loamy fine sand; slightly firm, but granular when removed.
A _{1b}	17-21"	Dark gray loamy fine sand (the old A ₁ of the Podzol).
A _{2b}	21-27"	Light to medium gray loamy fine sand.
B _{21b}	27-34"	Nearly black sandy orterde.
B _{22b}	34-36"+	Reddish-brown sandy ortstein.

Unfortunately this profile was not dug deeply enough and there is no time to finish it. Here some 17 inches of new soil has been worked over the old one.

We look at another soil near the margin of the field.

A _p	0-13"	Medium to dark gray light fine sandy loam. (This material has largely replaced the original.)
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B _b	13-28"	Brown, dark brown, and black sandy ortstein.
C _g	28" +	Mottled gray, yellowish-brown, and reddish-brown light fine sandy loam (fossil gley, partly active).

It appears that this soil was truncated during the reworking of the field and that the upper 13 inches is material brought in from the margins.

I get a picture here of the characteristic farmhouse to which the little orchard where we examine the soils is attached.

We now drive to a deep excavation that exposes a cross-section through rounded fields, where clay is being taken out for the manufacture of bricks near St. Nicolas. Although time is short, I am able to get some photographs of the cross-section. I note about 18 to 20 inches of surface soil, mainly loamy fine sand from the ditches, lying over the original heather Podzol, with the gray Tertiary clay deep beneath the solum. These ditches at the margins of the field improve the drainage so that the lower gleyed horizons are now fossil. One can see that roots go down to 6 or 7 feet now.

The excavation cuts across one of these large ditches. The material had been dug out and placed on the top, and then it gradually filled again, so that now there is about 8 feet of fill above the bottom of the original ditch.



K-1928 August 15, 1950
Belgium. Land of Waas, near Ghent. Profile
in rounded field. Heather Podzol overlain
by 18 inches of brown sand.



K-1929 August 15, 1950
Belgium. Land of Waas, near Ghent. Charac-
teristic farm house.



K-1930 August 15, 1950
Belgium. Near St. Nicolas. Section showing
20 inches of loamy fine sand, from the ditches,
over original heather Podzol, with gray
Tertiary clay at base. (Prof. Dr. C. H.
Edelman)



K-1931 August 15, 1950
Belgium. Near St. Nicolas. A large old ditch
between rounded fields, since filled about 8
ft. above the original bottom.

We now start for Louvain by way of Ghent. Time is running out and we shall be very late. After we get to Louvain, we have some trouble in finding the place to stay -- Justi-Lipsii College. Part of our difficulty was caused by the fact that both a statue and a railroad station also have the same name. We reach our rooms about 7:30, but dinner isn't called until 8:30. Then it goes slowly and noisily. We have (1) ham, eggs, and tomatoes; (2) soup; (3) pork, stringbeans, and potatoes; (4) chicken and compote; (5) pastry; (6) fruit; and (7) coffee. I am finally to bed at 10:30, with a very tired back.

August 16

I am up at 7:00 and find things go very leisurely. We have breakfast at 8:00. Finally we are in the buses at 9:00 and then wait one-quarter of an hour for Professor Baeyens. Then we drive around the campus and leave for the field at 9:30.

First we look at a Gray-Brown Podzolic soil from loess under an oak forest (Meerdaal). From what I can see, I should regard this as very close to the normal soil. The land is undulating and the geologists estimate that the loess was laid down about 10,000 B.C. I try to get pictures of the profile and of the landscape with oak, birch, and alder. It rains.

A ₀₀		Very thin brown leaf mat.
A ₀		Very thin layer of decomposed leaves.
A ₁₁	0-1½"	Very dark grayish-brown finely granular silt loam.
A ₁₂	1½-3"	Brown fine sandy loam; slightly firm in place, but easily friable to irregular granular.
A ₂	3-13"	Yellowish-brown (10YR 5/6) very fine sandy loam. Slightly firm in place, but easily friable.
B ₂	13-29"	Brown to strong brown (7.5YR 5/5), mottled with pale brown (which appears gray in the pit), heavy silt loam. Weak to moderate coarse angular blocky structure that is easily broken to medium; friable; vesicular. The soil is somewhat darker along the cracks.
B ₃₁	29-39"	Similar to B ₂ , except that the soil is slightly lighter in color and is a light silt loam to a very fine sandy loam and the structure is weaker.

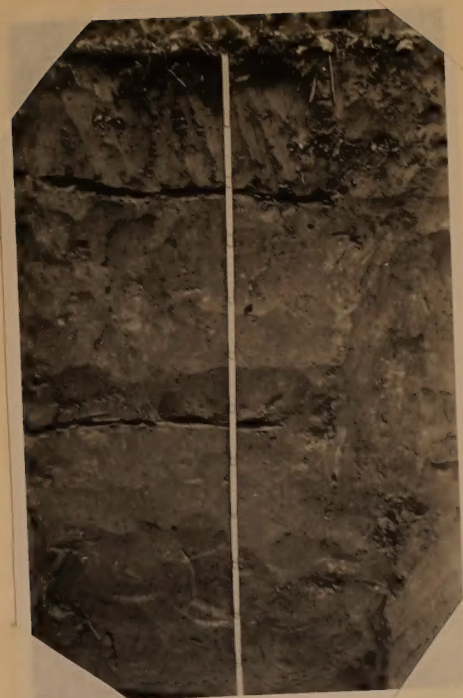
B₃₂ 39-72" The soil gradually becomes lighter in color through this horizon, approaching 7.5YR 6/6. The texture is a very fine sandy loam. The soil is massive, with only a suggestion of weak blocky; yet it digs out in easily friable chunks.

C 72-80"+ Massive, friable, yellowish-brown very fine sandy loam. The soil is said to contain a little calcium carbonate. Roots that go through the material appear to be associated with some pale brown streaking.

I look hurriedly at another profile lower on the same slope. Here, olive-yellow sand appears at 42 inches; there is a bit more gray in the upper A₂; and the B₂ seems somewhat lower in clay content. I note some man-made chips of flint within the B.

I go down to see a third profile, where the slope is very gentle, under a ground cover of Vaccinium. The organic surface suggests trockentorf rather than mull. The very surface resembles that of an intergrade between Podzol and Brown Podzolic. The texture in the surface is loamy fine sand. The soil has an irregular banding in texture down to the Tertiary sand at about 3 feet. There is a developed B, but it is irregular and varies in color from brown to yellowish-brown.

I feel that our guides have selected a confusing place and that the soil was once dug up to considerable depth. Here too, there are flint chips, and tongues of the A₁ go down as far as 14 inches.



K-1932 August 16, 1950
Belgium. In forest near Louvain. Profile
of Gray-Brown Podzolic soil from loess.



K-1933 August 16, 1950
Belgium. In forest near Louvain. Cover
of oak, birch, and alder on Gray-Brown
Podzolic soil.

We then look at a fourth profile said to be developed in the Tertiary sand. One may see evidences of Podzol, Brown Podzolic, and Brown Forest; but the soil is closest to the Brown Podzolic.

A ₀₀ & A ₀		Very thin and only about one inch altogether.
A ₁	0-1"	Medium to dark gray loamy fine sand, in places 2 inches thick.
A ₂		Only a faint suggestion.
B ₂	1-6"	Reddish-brown to dark reddish-brown loamy fine sand, very irregular in thickness.
B ₃	6-18"	Yellowish-brown loamy fine sand, irregular in thickness.
C	18-30"+	Nearly loose olive-yellow sand with reddish-brown bands about $\frac{1}{4}$ inch wide. The soil shows noticeable streaking up to 2 inches wide by big roots.

The horizons are very irregular and quite likely this area was also dug up at sometime or other. The slope is about 2 or 3 percent. The main trees are Scotch pine and a ground cover of bracken and blueberries.

We drive south along the main road to Namur (51) over an undulating plateau. Here most farmers live in villages and have about 50 to 60 hectares apiece. The loessal cover is said to be 7 to 8 meters in thickness. Over the long period since clearing, there has been considerable sheet wash, now stabilized through the formation of taluds -- short, steep slopes or terraces where the wash from higher slopes has accumulated at a stone wall or hedge.



K-1934 August 16, 1950
Belgium. In forest near Louvain. Scotch pine
with bracken and blueberries on soil trans-
itional between Brown Podzolic and Podzol.

It rains steadily.

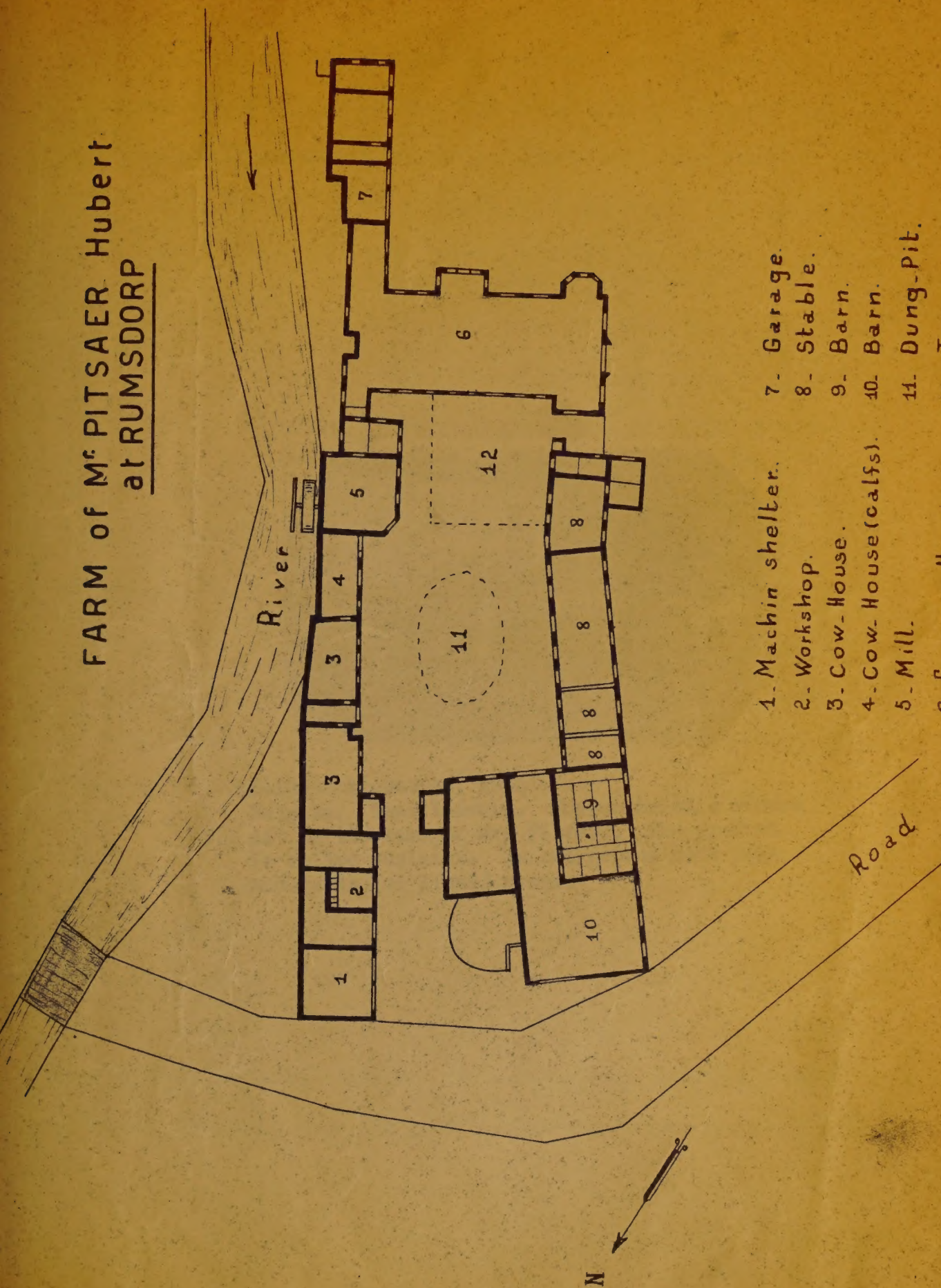
I see many good examples of little valleys extending themselves by gradual cutting into the plateau.

We go to the farm of M. Pitsaer for lunch. This is a large individual farm for this area with some 400 hectares and 4 workers besides the manager, plus others during harvest time. I get some pictures in the farmyard showing the manure pit for edelmist and the pumps and the carts used for handling the liquid manure.

After lunch we drive over old arable soils that are mainly slightly truncated Gray-Brown Podzolic soils with the present A_p mostly from the old B. (Locally called terre-a-brique.) I look at the soil near the top of a long gentle slope near Neerlanden.

A_p	0-9"	Brown to dark brown very fine sandy loam (10YR 4/3). Loose, and softly irregular granular.
B_2	9-25"	Faintly and coarsely mottled brown, strong brown, and dark brown silty clay loam, with coarse angular blocky structure breaking to medium; friable; vesicular. The structural aggregates have dark brown coatings, and the soil as a whole is a bit darker than the B of the first one seen today.
B_{31}	25-42"	The soil is similar to the above, but slightly darker in color and lower in clay content.
C	42" +	Yellowish-brown (10YR 5/6) very fine sandy loam, with weak coarse blocky structure, slightly prismatic. The soil is highly vesicular and very easily friable.

FARM of M^r PITSAER Hubert at RUMSDORP



- | | |
|-----------------------|---------------|
| 1. Machin shelter. | 7. Garage. |
| 2. Workshop. | 8. Stable. |
| 3. Cow-House. | 9. Barn. |
| 4. Cow-House (calfs). | 10. Barn. |
| 5. Mill. | 11. Dung-Pit. |
| 6. Farmers House | 12. Terrace. |



K-1935 August 16, 1950
Belgium. Near Louvain. Characteristic manure
pit on the farm of Mr. Pitsaer. The product
is called edelmist. In background note pump
and carts for liquid manure.

Cereals and sugarbeets are grown on this well-drained, gentle slope. I look at the soil lower down on a nearly level footslope where some material has accumulated from above.

A _p	0-8"	Brown (10YR 5/3) silty very fine sandy loam.
A ₃	8-17"	Pale brown (10YR 6/3) very fine sandy loam, with a few thin gray streaks.
B	17-44"	Yellowish-brown (10YR 5/4) heavy very fine sandy loam. Friable; coarse irregular blocky to prismatic structure; vesicular.
A _{pb}	44-50"+	Very dark brown (10YR 3/4), friable, silty clay loam.

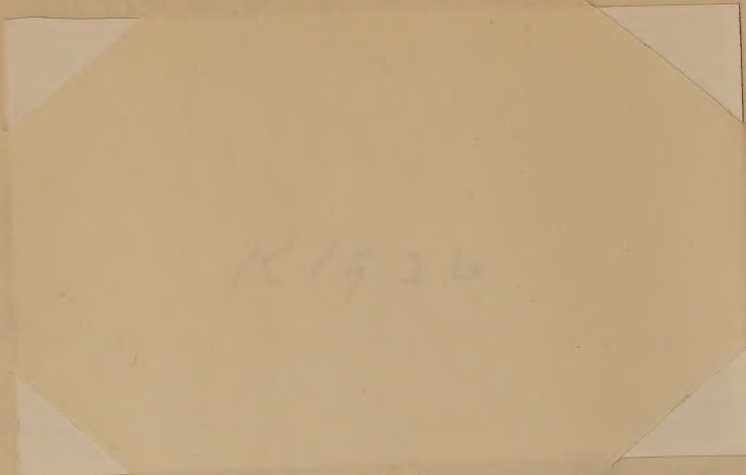
This Gray-Brown Podzolic soil was first truncated and a cultivated A_p developed from the B, and then later was very gradually thickened with accumulations from the higher slopes so that this last horizon is the old plowed soil developed from the original B. Our guides tell us that this soil is nearly as fertile as the first one, but lower in productivity because it is drier. I rather question this interpretation, although it may be true so long as crops consist of cereals and sugarbeets. With livestock and long leys in rotation, I suspect that the productivity of the two soils might be reversed. Unfortunately, this area has small, fragmental holdings by farm families living in the village. The land rights go back to early medieval times. The first step for improving agriculture is a consolidation of these fragments into unit holdings that can be conveniently fenced.



K-1936 August 16, 1950
Belgium. Near Louvain. Lowland in foreground
is separated from land above by short steep
slope called talud.



K-1937 August 16, 1950
Belgium. Near Louvain. Another view of low-
land in foreground separated from land above
by short steep slope called talud.



K-1936 August 10, 1950
Belgium. Near Louvain. Lowland in foreground
is separated from land above by short steep
slope called talud.



K-1937 August 10, 1950
Belgium. Near Louvain. Another view of low-
land in foreground separated from land above
by short steep slope called talud.

On the whole, the soils resemble those in the Middle West of the United States, developed from loess under forest.

I try to get pictures here of a talud, but I am afraid it is too rainy. Now the erosion is quite well stabilized by these taluds.

I look hastily at the soils near the stream in the valley. These were originally gley soils, including bogs, but have since been covered with alluvium that came over them after the beginning of cultivation. Before that, when the land was in forest, there was apparently not much erosion. On the whole, this gradual erosion has probably been a good thing, partly through covering these wet soils so that they are now usable as pasture land or as arable land.

We get back to our rooms just before 6:00 and have dinner at 7:00. I spend an hour or so after dinner chatting with Professor Baeyens.



K-1938 August 17, 1950
Belgium. City hall in Louvain.

August 17

We leave Louvain about 9:00 and go past Tienen along the same road as we went yesterday. We stop to see the famous astronomical clock at St. Truiden. It shows the seasons, the signs of the zodiac, the tides, and the times at various parts of the world. On the hour, bells ring and a procession of little people come out, including the Mayor and various tradesmen.

We pass through the fruit-growing section of Borgloon. The brown soil built up from colluvium, or, more strictly, local alluvium, is said not to be so good for fruit trees as the "terre-a-brique." Below the dark grayish-brown surface, the soil is light yellowish-brown, compact, very fine sandy loam that is finely mottled with yellowish-brown and reddish-brown. This material is nearly massive. It is firm in place, but when dug out is easily friable. Roots grow rather poorly because of excess water in winter and lack of water in summer. Here the soil is gently sloping, with the "terre-a-brique," or truncated Gray-Brown Podzolic, in the far background. We look at one of these somewhat higher on the slope developed from loess. As far as I can see, it is like the one we saw yesterday afternoon at the highest elevation. The soil has been leached and has calcium carbonate at about 5 feet. The roots penetrate the soil with blocky structure satisfactorily.

We glance hurriedly at a wet local alluvial soil tending toward Gray-Brown Podzolic in the upper part, but with old and

still active gley at 42 inches. Trees do very poorly indeed. In another, the trees are nearly all dead. Even though the gley is deeper, the soil is mottled to the very surface. With community planning, proper drainage structures could improve these soils a good deal.

Here fruit trees get about 500 kg. per hectare of sodium nitrate; about 1000 of basic slag, and about 800 of 40-percent potash salts.

We drive on through Tongeren and stop briefly for a look at the cathedral. We then drive through the "Land of Herve." This is mostly rolling grassland for cattle, with a few orchards. The country is very beautiful, but unfortunately the light is too poor for good pictures.

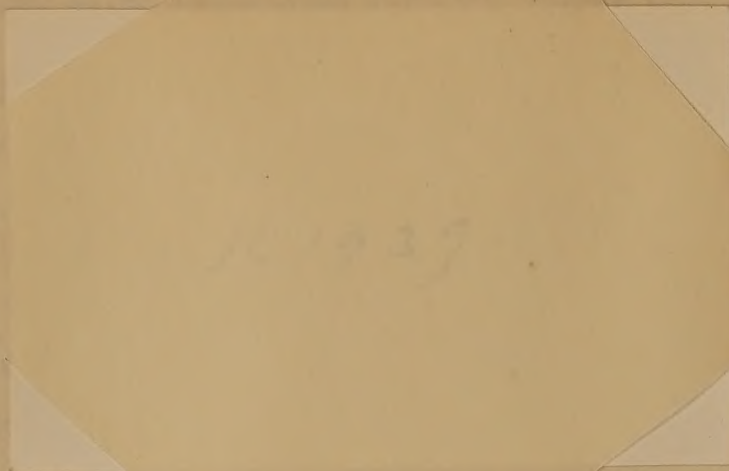
We arrive at Liege about 5:00 and I have a nice room in the Hotel de Chemin de Fer.



K-1939 August 17, 1950
Belgium. In the Land of Herve, south of Aubel.
Landscape.



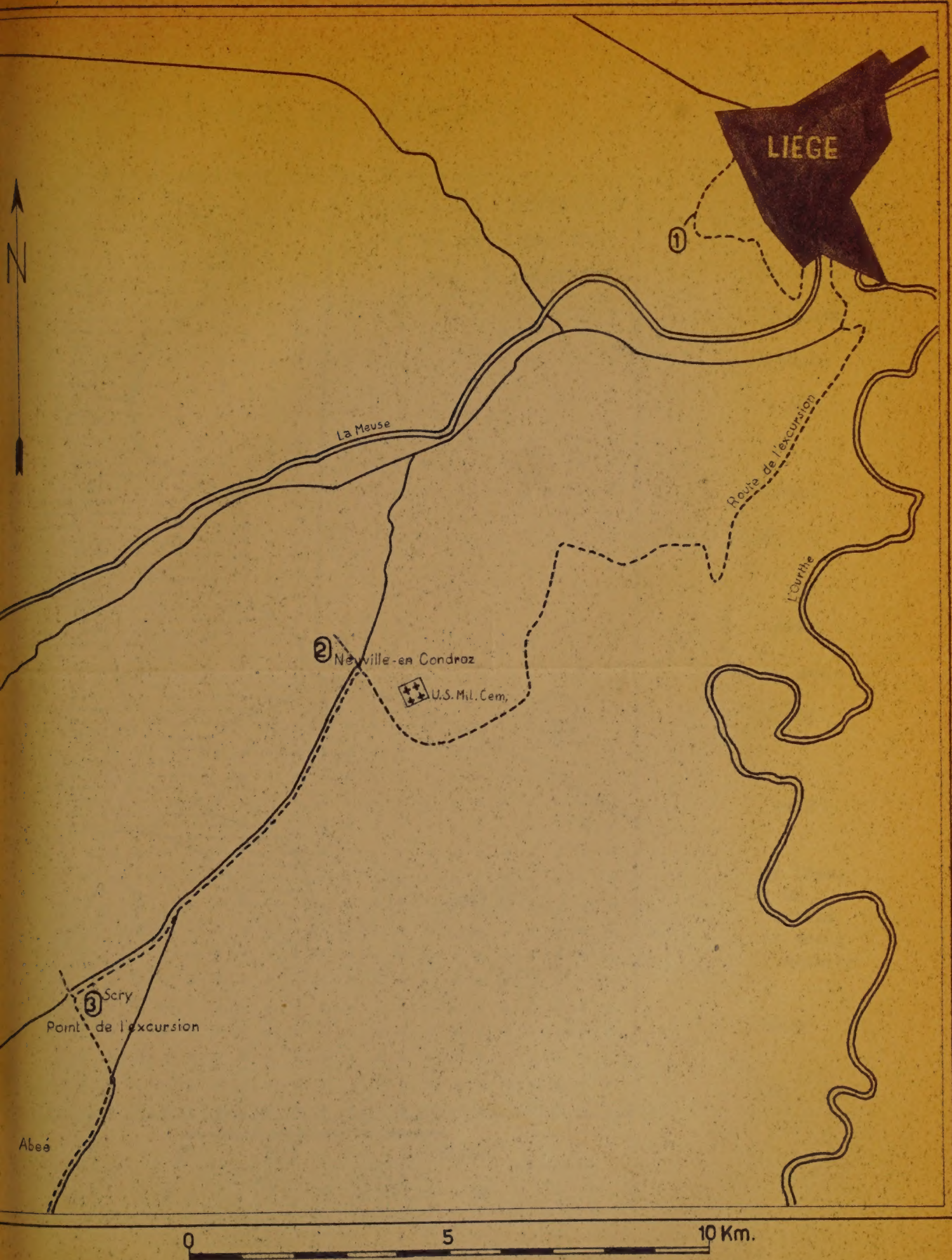
K-1940 August 17, 1950
Belgium. In the Land of Herve, south of Aubel .
Farmhouse.



K-1939 August 17, 1950
Belgium. In the land of Herve, south of Aube.
Landscape.



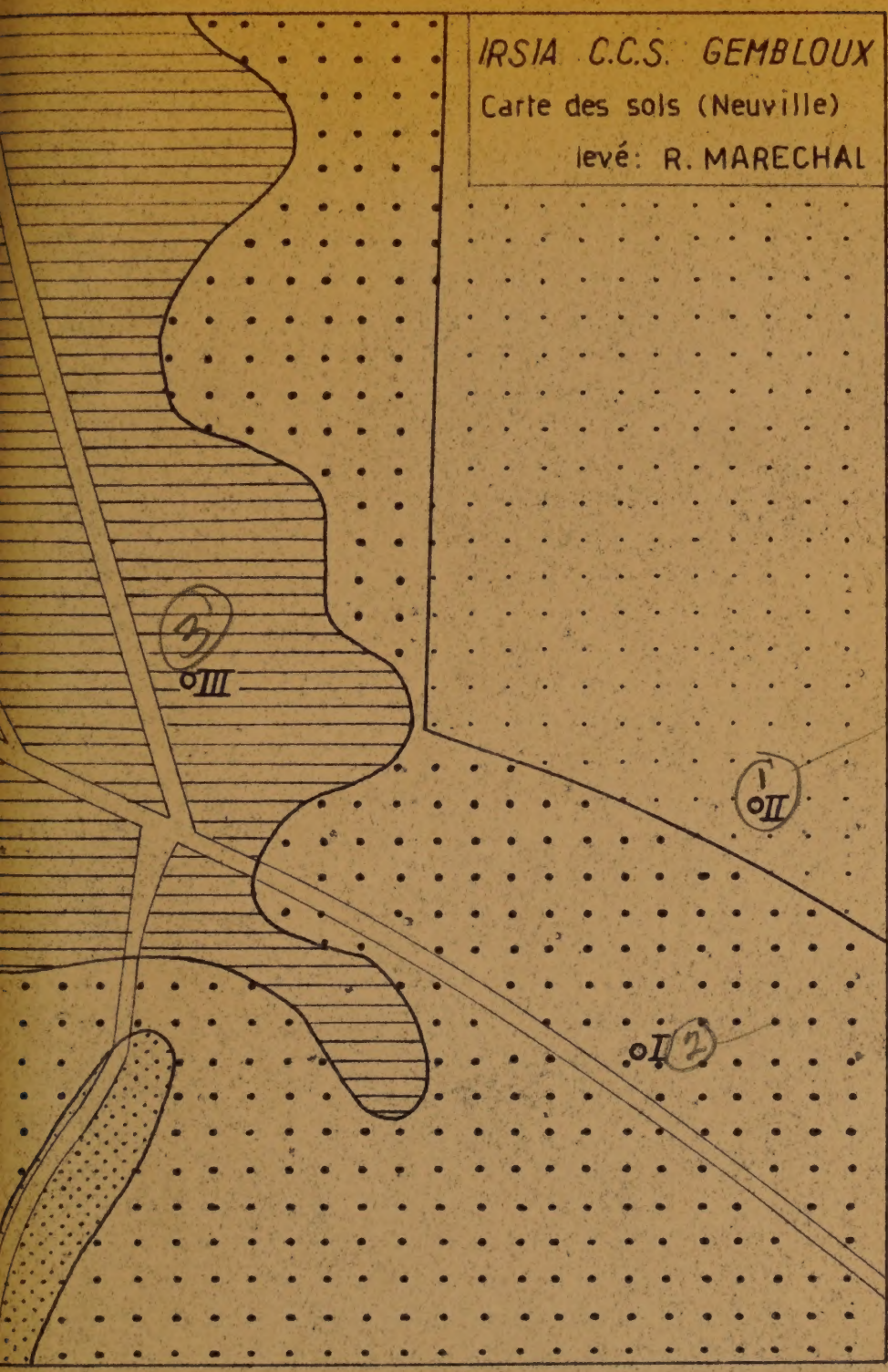
K-1940 August 17, 1950
Belgium. In the land of Herve, south of Aube.
Farmhouse.



Carte de l'excursion dans la région Condrusienne
19 août 1950.

August 18
Step 2

AMET - NEUVILLE - en - CONDROZ



August 18

We leave the hotel about 9:15 in a cool, cloudy morning. We stop in the industrial area near Liege to take a look at old weathered heaps of mine tailings. Some of these have been leveled and used for gardens. After the mine dumps have leached for 50 years or so, they may be leveled and made fairly productive with abundant manure and fertilizer. Formerly, about 100 tons were used to the hectare, but now that is not possible.

We drive by the American cemetery at Neuville-en-Condroz near Liege, which contains an enormous number of graves of American soldiers from the battle of Bastogne.

We stop to look at the soil (2, page 4 of the Guide) near Neuville-en-Condroz on an area said to have been deforested several centuries ago. This smooth, undulating plateau has a cover of loess, thin in places.

A _p	0-9"	Dark grayish-brown (2.5Y 4/2) heavy very fine sandy loam. Soft fine crumb.
B ₂	9-24"	Yellowish-brown (10YR 5/4) silty clay loam, with strong medium to coarse, blocky to prismatic structure. This soil is faintly mottled with hues and there are a few small reddish-brown concretions. Slightly vesicular and friable with some difficulty.
B ₃	24-40" (variable)	Like the above, but with somewhat weaker structure.
C	40" +	Massive, very fine sandy loam, mottled yellowish-brown and brownish-yellow. Friable when removed.

Drainage is good to imperfect in the upper part, but slow in the lower part.

I am told that wheat yields here about 2 tons per hectare.

I then look at another profile (1) quite like the first, but only cultivated for about 50 years. Some remnants of the old A_2 remain between the A_p and the B_2 . This A_2 is a brownish-yellow very fine sandy loam about 6 inches thick. Besides, there is a transitional B_1 of nearly the same thickness, except for a few tongues that go deeper. In this soil, the structure in the B is not strong and one sees quite a bit of dark reddish-brown mottling.

I try to get a picture to show the landscape by standing on this profile and pointing the camera at the first one described.

We then look at a soil (3) developed from loess rather thin over a kind of schistose-sandstone.

- | | | |
|-------|-------------|---|
| A_p | 0-9" | Grayish-brown (10YR 5/2) fine to very fine sandy loam, with mixed granular and sub-angular blocky. Friable. |
| A_2 | 9-(14-19)" | Very pale brown very fine sandy loam, strongly and finely mottled with yellowish-brown and reddish-brown. Fairly friable, irregular angular blocky. |
| B | (14-19)-28" | Reddish-brown (5YR 5/4) fine sandy clay loam. Hard, medium to coarse, angular blocky-prismatic structure. Some gray mottling in the cracks. |
| C | 28-32" + | Reddish-brown (5YR 5/3) fine sandy loam to fine sandy clay loam. Coarse blocky structure that breaks into strong medium angular blocky when dry. Plastic when moist. Some stones. |

Drainage is good to imperfect in the upper part, but slow

in the lower part.

I am told that wheat yields here about 2 tons per hectare.

I then look at another profile (1) quite like the first, but

only cultivated for about 50 years. Some remnants of the old

A₂ remain between the A₁ and the B₁. This A₁ is a brownish-

yellow very fine sandy loam about 6 inches thick. Besides, there

is a transitional B₁ of nearly the same thickness, except for a

few tongues that go deeper. In this soil, the structure in the

B is not strong and one sees quite a bit of dark reddish-brown

nothing.

I try to get a picture to show the landscape by standing

on this profile and pointing the camera at the first one described.

We then look at a soil (?) developed from loess rather thin

over a kind of schistose-sandstone.

Grayish-brown (10YR 5/2) fine to very fine
sandy loam, with mixed granular and sub-
angular blocky. Friable.

0-20"

A₁

Very pale brown very fine sandy loam,
strongly and finely mottled with yellowish-
brown and reddish-brown. Fairly friable,
irregular angular blocky.

2-(11-12)"

A₂

Reddish-brown (2.5Y 5/4) fine sandy clay loam.
Hard, medium to coarse, angular blocky-
prismatic structure. Some gray mottling in
the cracks.

(11-12)-(28"

B

Reddish-brown (2.5Y 5/3) fine sandy loam to
fine sandy clay loam. Coarse blocky structure
that breaks into strong medium angular blocky
when dry. Plastic when moist. Some stones.

28-32" +

C

The drainage is imperfect to good. The slope is very gentle. Probably the B and C have been mixed through solifluction. Wheat yields are only fair, but adjacent clover stands look good.

I try to get some idea of fertilizer use and my guides tell me that first of all lime is used to try to get a pH of around 7.0 to 7.2. On sugarbeets, in addition to 35 tons of farm manure per hectare, they use 120 to 140 kg. of N, 95 to 100 of P_2O_5 , and 200 to 240 of K_2O . For oats and wheat, they use 40 of N, 50 of P_2O_5 , and 100 of K_2O . For lucerne and clover, they use 50 of P_2O_5 and 100 of K_2O . A common rotation is sugarbeets, wheat, oats, and clover or lucerne.

We go to a new and very nice school for lunch -- the Provincial School of Agriculture at Abée-Scry.

We go next to look at a landscape near Villers-le-Temple. According to our guides, the geological bedrock is mainly psammities and limestone.

I look at a profile of a soil.

A _p	0-9"	Dark grayish-brown very fine sandy loam. Softly and irregularly granular.
A ₂ or A ₃	9-17"	Yellow (10YR 7/6) very fine sandy loam, mottled with reddish-yellow and some light gray. Weak irregular medium blocky. Friable with some difficulty.
B ₂	17-(26-32)"	Mottled reddish-brown, yellow, and reddish-yellow sandy clay loam with coarse irregular blocky-prismatic structure. Some fragments of weathered schist. Grades into:

C 32-36"+ Yellow, gray, and reddish-yellow stony weathered schist.

The slope is about 4 to 6 percent. The soil is well drained externally, but drainage is slow in the lower part of the profile. In the old days, farmers used to plow 10 to 12 inches deep every 7 years, but now they plow only about 3 inches deep. I see good yields of oats.

We then look at a profile developed from material weathered from limestone.

A _p	0-4½"	Dark grayish-brown (10YR 4/2) silt loam. Mixed granular and fine blocky.
A ₃	4½-(9-11)"	Transitional in color and structure.
B ₂₁	(9-11)-21"	Dark brown, faintly mottled with hues, blocky-prismatic clay. Coarse blocks break into medium angular ones that are friable with difficulty.
B ₂₂	21-38"	Dark brown to very dark brown heavy clay. Some block faces are nearly black. The angular blocks are coarse and friable with great difficulty. Tongues run deep and there are some inclusions of D.
C	38-40"+	Dark brown nearly massive clay over:
D		Irregularly dark-bluish crystalline dolomitic limestone.

The slopes are about 3 to 6 percent and irregular. Internal drainage is slow. Our guides suggest that the material may have been mixed during glacial times, as they say, Niveo-fluvial times.

Nearby, I look hastily at a soil developed essentially from the Tertiary fine sand over which heavier materials from the

weathering schists have been deposited through old solifluction, possibly during Pleistocene. The soil is certainly badly mixed and naturally is much drier than the first one.

I look at a Gray-Brown Podzolic soil developed either from old local alluvium or loess with limestone beneath. It is well drained because of the limestone. Even though the A_2 horizon has been removed, the solum is about 40 inches thick. The B has strong blocky-prismatic structure, and internal drainage is good.

I look hastily at a soil developed on colluvium or local alluvium from loess. The surface soil is a very fine sandy loam and the B is only feebly developed. Apparently the clay went out into the main stream during the process of deposition. The soil has good drainage now because of the deep substratum of limestone and supports an excellent pasture.

The wind has been blowing hard and cold for a long time and now we have a heavy shower. We drive on toward Namur. On the way we stop for a few moments at a large farm built in the old style.

We arrive at the Hotel de Croix just in time to change and go for a reception at the City Council. I am somewhat embarrassed, since the main party did not go to the hotel and change and the proceedings were held up for my arrival. We have a few pretty speeches and some nice port wine. Afterwards I go to dinner chez Manil.

weathering schists have been deposited through old solution, possibly during Pleistocene. The soil is certainly badly mixed and naturally is much finer than the first one.

I look at a Gray-Brown Podzolic soil developed either from old local alluvium or loess with limestone beneath. It is well drained because of the limestone. Even though the A horizon has been removed, the solon is about 10 inches thick. The B has strong blocky-prismatic structure, and internal drainage is good.

I look next at a soil developed on colluvium or local alluvium from loess. The surface soil is a very fine sandy loam and the B is only feebly developed. Apparently the clay went out into the main stream during the process of deposition. The soil has good drainage now because of the deep substratum of limestone and supports an excellent pasture.

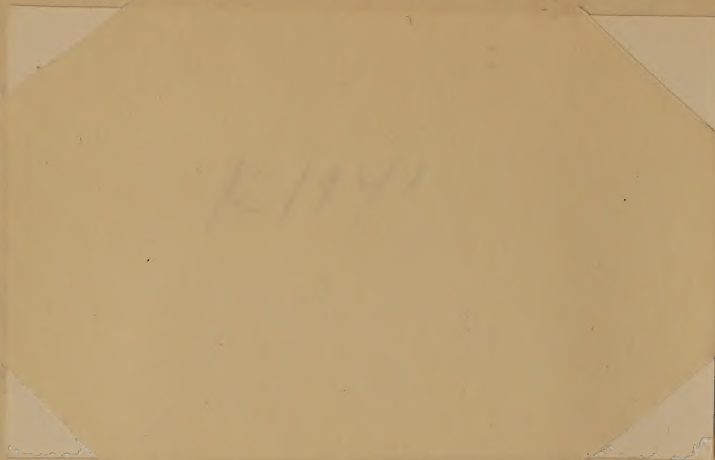
The wind has been blowing hard and cold for a long time and now we have a heavy shower. We drive on toward Hapur. On the way we stop for a few moments at a large farm built in the old style. We arrive at the Hotel de Croix just in time to change and go for a reception at the City Council. I am somewhat embarrassed, since the main party did not go to the hotel and change and the proceedings were held up for my arrival. We have a few pretty speeches and some nice port wine. Afterwards I go to dinner chez Mami.



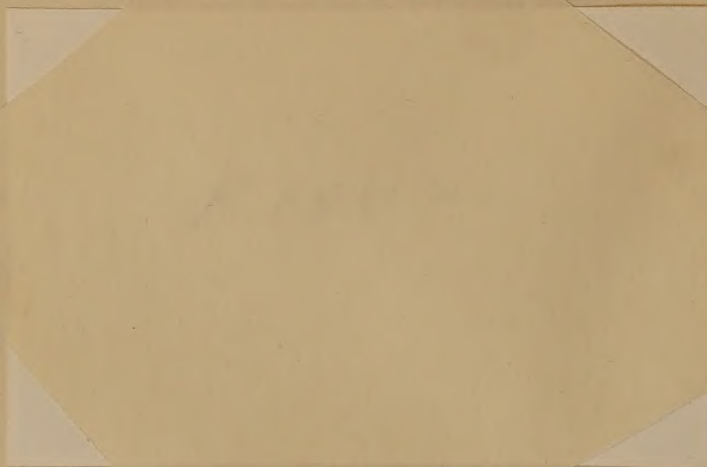
K-1941 August 18, 1950
Belgium. Near Liege. Here old mine tailings,
which have weathered for more than 50 years,
have been leveled and are used for gardens.
See mine dumps in far right.



K-1942 August 18, 1950
Belgium. View over smooth Gray-Brown
Podzolic soil from loess.



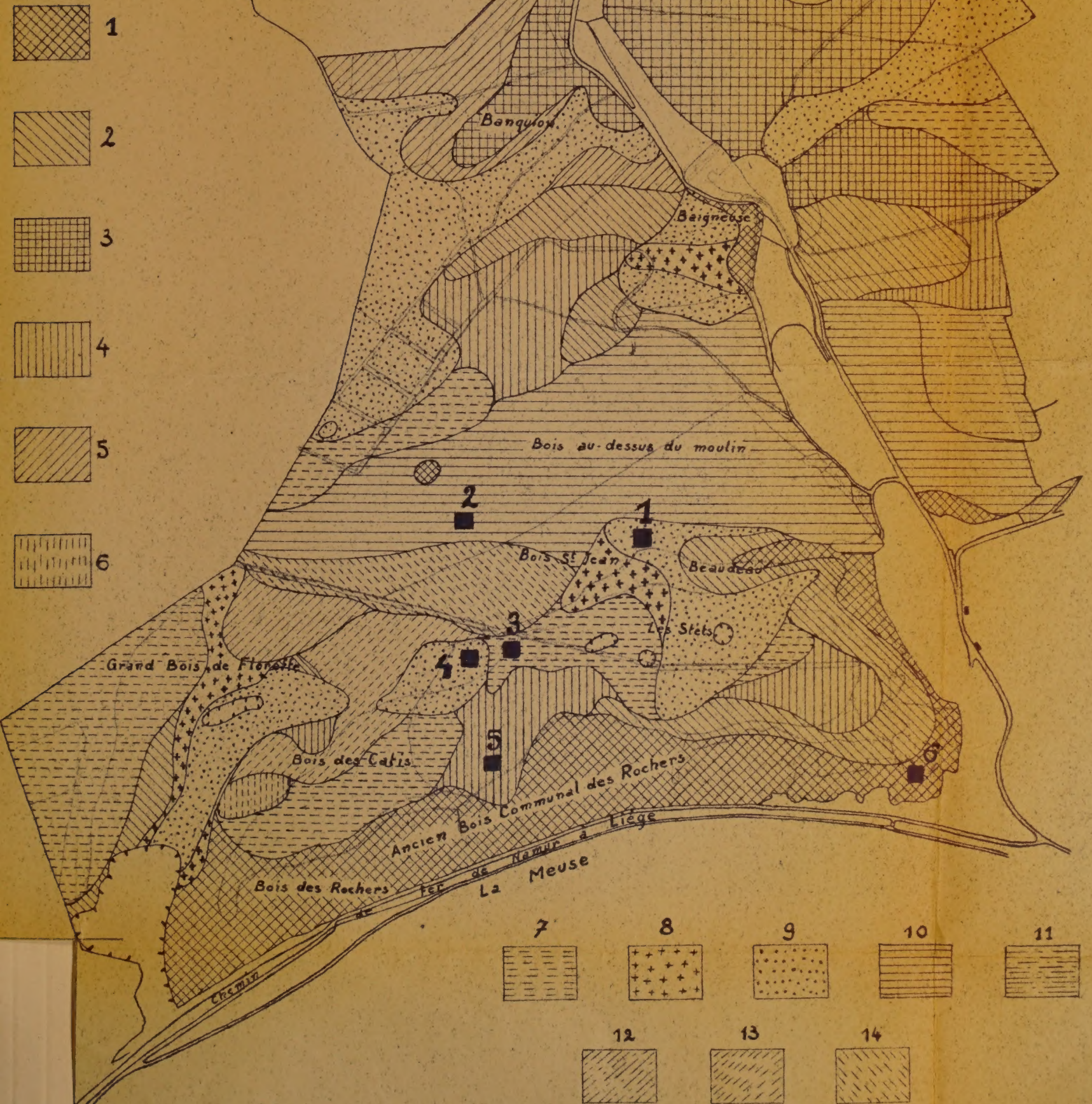
K-1941 August 18, 1950
Belgium. Near Liège. Here old mine tailings,
which have weathered for more than 50 years,
have been leveled and are used for gardens.
See mine dumps in far right.



K-1942 August 18, 1950
Belgium. View over smooth Gray-Brown
Podsollic soil from loess.



Domaine de Marche-les-Dames



August 19

We leave on the last of the Belgium tours at 8:45 and go out to the margin of a large forest, through which we make a tour mostly on foot.

The first soil I look at is developed under the forest from loess over limestone or schist in the middle part of a long slope of about 15 percent. I suspect that natural erosion was once much stronger than it is now. The leaves wash down the slope and the ground cover is moss. The trees are mostly beeches with some oaks. The soil is well drained.

- | | | |
|----------------------------------|--------|---|
| A ₀₀ & A ₀ | | Very thin. Mostly mosses. |
| A ₁ | 0-1" | Very dark gray very fine sandy loam in clumps held by roots. |
| A ₂₁ | 1-2" | Gray to grayish-brown light very fine sandy loam. Firm, but easily friable to fine granular. In the lower part of this thin horizon, which is only 1 to 2 inches thick, a brown staining suggests the beginning of the B of a micro-Podzol. |
| A ₂₂ | 2-11" | Pale yellow light very fine sandy loam. Nearly massive, but easily friable. |
| A ₃ | 11-16" | Pale reddish-yellow (appx. 7.5YR 6/6) very fine sandy loam with very weak coarse blocky structure. Firm, but easily friable; vesicular. |
| B ₁ | 16-20" | Transitional. |
| B ₂ | 20-40" | Strong brown (7.5YR 5/6) heavy silt loam with moderate medium angular blocky structure. Friable. Some pale gray coatings on the peds. |

C 40-45" Brown to strong brown very fine sandy loam. The blocky structure of the upper part gradually gives way to massive that is firm in place and friable when removed. Roots penetrate the whole soil easily.

I go on to a higher plateau-like area under beech. There is a very faint evidence of a micro-Podzol on top of a lithosolic Brown Podzolic. The thin solum from loess lies over weathered rock at about 20 inches. The soil above the rock is yellowish-brown (10YR 5/6) fine sandy loam containing many roots.

Then I see a micro-Podzol developed over Gray-Brown Podzolic formed from old gravels of uncertain origin, probably Pleistocene. The surface is undulating and the pebbles are nearly all quartz.

A₀₀, A₀, and A₁ All very thin -- about 2 inches.

A₂ 2-12" Yellow (10YR 7/6) gravelly very fine sandy loam, firm in place. Tongues reach to 20 inches.

B₂ 12-32" Strong brown and yellowish-brown (7.5YR 6/6 - 5/6) gravelly clay, with weak medium angular blocky structure. Firm in place.

The soil gradually loses structure in depth, but the pit is too shallow to examine the C.

We look at a somewhat similar soil under oak and there is no evidence of micro-Podzol. Then I walk over to a Gray-Brown Podzolic soil from loess, but without the micro-Podzol and not degraded by beech. There is excellent root growth down to 28 inches, but part of the roots stop within the B₂.

We are then taken to what is said to be a leached Rendzina from dolomite on a gentle slope.

A ₁	0-2"	Dark gray loam with mixed coarse granular and rounded blocky structure.
A ₂	2-5"	Brown granular clay loam.
B ₁	5-10"	Yellowish-brown and brown heavy clay with irregular angular blocky structure. Friable with difficulty. Some small dark brown concretions.
B ₂	10-20"	Dark brown to reddish-brown heavy clay with irregular strong blocky structure. Irregular in thickness.
C	20-24"	Dark gray sandy and stony weathered dolomite.

The soil has developed partly from colluvial wash from the pebbly formations. I should call it a Gray-Brown Podzolic.

It rains very hard as we look at the last profile, said by our guides to be Rendzina and which I should call a beautiful Brown Forest "right out of the book." The surface A₁ is very dark brown, with granular to rounded blocky structure. The dark brown gradually fades to the depth of the pit at 30 inches.

It rains hard and we go back to the hotel to wash and change our clothes. Then we have lunch and go to the final reception at the seat of the provincial government for a few pretty speeches and a general round of farewells. This is the final end of the Fourth International Congress.



K-1943 August 19, 1950
Belgium. Near Namur. House and garden, near
margin of forest preserve.



K-1944 August 19, 1950
Belgium. A forest preserve near Namur. Forest
of beech on micro-Podzol over Gray-Brown Podzolic.



K-1945 August 19, 1950
Belgium. A forest preserve near Namur. Forest
of beech on lithosolic Brown Podzolic.



K-1946 August 19, 1950
Belgium. Near Namur. Dr. Bradfield.

Tavernier, Edelman, and I drive back to Brussels through the loessal area, much of which is open with most of the farmsteads concentrated in the villages. It is said that part of this has only been farmed during the past century or so. We go through an interesting area with a great many glasshouses used for large table grapes. Some of these are shipped to New York by air.

We deliver Professor Edelman at his railway station about 4:00 and I check on my flight to London in the morning and get a room in the Siru Hotel. Tavernier takes me to dinner at the "Two Keys" and afterward we call at the home of Professor van Strahlen for a chat about the soil survey.

August 20

After breakfast, Tavernier and I meet with Dr. L. Henri, Director, and Professor V. van Strahlen, Chairman, of IRSIA and go over the soil survey program of Belgium in detail.

(I found after I came to Holland that there had been some arguments within the Board of IRSIA, which is financing the soil survey, about its program and that decisions were deferred until after I had a chance to look at the work.)

We discuss all phases of the program and I suggest some changes in emphasis that seem to be well received. Both representatives of IRSIA suggest that Prof. Dr. Tavernier visit us in the United States this autumn.

Tavernier takes me out to the Brussels airport and we have a last chat about the soil survey and the International Society. It is a bit hard to say goodbye.

I am in the air out of Brussels by Sabena at 1:35 and down at the London airport at 3:20 p.m. I have never gone through customs so fast. We are on the bus and on our way into London within 20 minutes. I taxi to the bus station and arrive in Harpenden at 5:35, in time for high tea with Mommy and the Muirs. After a little chit-chat, I realize how terribly tired I am, and go to bed with the decision to have a rest tomorrow.

PARIS

SECOND EDITION. ARMY/AIR



August 21

I spend the day at Rothamsted talking with Dr. Muir, Dr. Greene, and Dr. Crowther about their work and the things that are now engaging their attention.

August 22

I go with Dr. Greene into London and call at the American Embassy. I talk with Paul Nyhus, our Agricultural Attache, and M. D. Crawford of ECA about the technical assistance projects for British Africa. Crawford shows me some projects that have just come in from the British, including one for irrigation, mainly of rice, in the Kafue Flats in Northern Rhodesia. He also talks about one in Nyasaland on soil fertility, and a couple or three others dealing with other phases of agriculture.

At 11:00, Greene and I go to meet Mr. G. F. Clay, Agricultural Adviser to the Minister of Colonies, and immediately a conference is arranged on all the technical assistance projects in British Africa that have to do with soils and fertilizers. Besides Clay and Greene, there are Keen, Grimwood, Herklots, Spurway, Mathieson, and Hibbert. I am told that the report prepared by Lambert, McCall, and Cline a year ago had been studied thoroughly by a subcommittee on soils of the Colonial Advisory Committee on Agricultural and Forestry Research. After this study, the project statements and the

[illegible]

FIELD SOIL DESCRIPTION SHEET

Notes.

System of Agric. Pract.

Poss. of Reorganization.

Need for, or response to fertilizers.

Continue notes on back of form.

FIELD SOIL DES.

1. Locality	2. Date	3. Time
4. Soil description	5. Soil color	6. Soil texture
7. Remarks		
8. Plant	9. Height	10. Fruit
11. Summary		

comments of the subcommittee were sent to the individual administrators in the colonies. Some were dropped out and others revised for several reasons.

We then plunge into a discussion of the individual projects as set up in the Lambert, McCall, and Cline report, and it turns out that the British have in mind requesting 8 soil scientists for soil classification and mapping, 2 for soil management, 3 in soil chemistry, and 2 in soil microbiology.^{1/}

During the discussions, it seems to me that both Clay and Nye understand the point I make with all possible emphasis, that ECA is not interested in filling scientific positions. The idea is, rather, that if there are skills that Americans have that would be helpful in speeding up the establishment of research and advisory programs, they should try to get those Americans assigned, assuming, of course that the British will supply both opposite numbers and junior staff. Even though I emphasize this as much as possible, I am not sure that the "line administrators" in the Colonial Office understand this. I hope they do. I further point out that any American scientists worth sending are exceedingly busy men, and in order to go to Africa, shall need to drop very important work in the United States. Thus, all of us need to be very sure that the

^{1/} The details of these discussions are scarcely relevant to this Journal. A summary may be had from the files in a memorandum to Dr. D. A. Fitzgerald of ECA dated September 14, 1950.

time of such men will be spent as efficiently as possible. The discussion around the table among the British on progress in staff recruitment is not at all encouraging. I can't help having the feeling that they lack aggressiveness. Certainly they lack appealing literature that sets forth the opportunities in a readable style. We also discuss the important matter of retirement, that I had discussed with them in 1948. A scheme has been worked out whereby a man can accumulate credit toward retirement now from any British colony and from the homeland. This should help recruitment a great deal as contrasted to the old system under which a man had to spend all his time in one place. I am given a little booklet outlining the regulations, yet I doubt if anyone short of an experienced judge could understand it. Certainly they need something far simpler to put in the hands of a university student considering the Colonial Service for a career.

After the conference, I have a late lunch with Dr. Greene, Dr. Keen, Mr. Nye, and Mr. Clay. During lunch I raise a question about the cartographic service that will be necessary as a base for the soil mapping, and Clay urges that I visit their headquarters near London.

I also urge the group that big advantages would ensue from very close cooperation between the survey work in Africa and that in Britain itself. I point out that the soil scientists will be looking to Britain for guidance and training, and that they can

only expect to develop the highly technical laboratory needed for many determinations in Britain, probably at Rothamsted. I suggest that junior staff might be recruited into the British Soil Survey, for preliminary training at least, before going to Africa.^{1/}

We also discuss the plans for combined research services in the East African Agricultural and Forestry Research Organization under Keen.

After lunch, Dr. Greene and I return to Rothamsted. I have tea with Dr. and Mrs. Greene and then return to Muir's home. After a little chit-chat, I am off to bed.

^{1/} This matter was later discussed in detail with Dr. Muir and a special memorandum prepared to Muir and Clay about it.

August 23

This morning I go to London again on the "8:35" and to the American Embassy. Here I have a long talk with Mr. M. D. Crawford of ECA and give him a detailed review, with his secretary taking notes, of my conferences yesterday, including my understanding of progress and plans of each project dealing with soils as outlined in the Lambert, McCall, Cline report. I explain some of the difficulties and point out the importance of our people in the Embassy having more opportunity for informal discussion of the problems involved with Mr. Clay and Mr. Nye, whom I regard as very well informed agriculturists. It is just too bad that the conversations between the American and British apparently have to go through more or less "line bureaucrats" who do not even have a vocabulary for discussing the subject-matter content of these important projects.

After lunch, I again return to Harpenden.

August 24

Dr. Greene, Dr. Muir, and I drive over to the Directorate of the Colonial Survey at Teddington. This turns out to be a long trip and a rather difficult and tortuous one because of all the main roads that must be crossed. We meet with Lt. Col. W. D. C. Wiggins for a short time and then are taken over the office by Capt. Bussey. We look over all of their main processes, which seem to be going forward competently. I see several examples of the various kinds of planimetric and topographic maps they are producing and agree to send them examples of our soil maps.

We leave a little after 12:00 and stop for lunch; and then have a few moments in the Kew Gardens. Unfortunately, it begins to rain and we drive back to Harpenden in the rain all the way.

August 25

I spend the morning with Dr. Greene in further discussion about the work in Africa. I call Mr. Clay on the telephone and make three suggestions to him:^{1/} (1) that the Colonial Survey needs some high-quality, dimensionally stable, plastic paper for map assembly that might be obtained through ECA until British factories get into production; (2) that Clay and Nye try to arrange for informal conferences with our agricultural people in the American Embassy and in ECA, to talk more about the subject-matter content of the technical assistance projects in Africa and the various sorts of difficulties involved; and (3) that Clay and Muir, along with Herklots and Greene, develop a joint memorandum for close coordination between the soil survey in the United Kingdom and the proposed surveys in Africa.

I have a talk with Dr. Bloomfield in Dr. Muir's laboratory on gleying, to which he is giving a lot of attention. He thinks that the ferrous sulphide in gley is more or less incidental, so that all gleys are not necessarily subject to changes in color. He has started his researches on this question of why the gray color is sometimes stable and sometimes not.

I also have a talk with Dr. Osmond, Assistant Director of the Soil Survey, about the interpretation of soil maps, including some of his work done about Bristol. This leads into a discussion of the draft copy of the Soil Survey Manual, which recently arrived from my office.

^{1/} These are later set forward in a memorandum after my return to the United States.

I am back with Muir about 6:00, and Mommy comes in at 7:30 after a two-day visit with the Russells at Oxford.

August 26

This morning promises to be a nice day, so I go out to look at the Park grass plots in order to get some photographs. But luck is against me. Just as I nicely get started, it begins to cloud over; and before I am well started, it begins to rain.

I spend the afternoon summarizing my notes on Holland and Belgium.

August 27

I do little this Sunday besides write a short piece on British agriculture to send home.

We have dinner with the Muirs at the Old Cock Inn and visit the laboratories for a while in the afternoon.



K-1947 August 26, 1950
England. Rothamsted. Classical grass plots.
Plot treated with ammonium sulphate: limed on
left, not limed on right.



K-1948 August 26, 1950
England. Rothamsted. Classical grass plots:
ammonium sulphate on right; N, P, K, Na, Mg
on left.



K-1949 August 26, 1950
England. Rothamsted. Classical grass plots:
N, P, K, Na, Mg, on right; N, P, Na, Mg, on left.



K-1950 August 26, 1950
England. Rothamsted. Classical grass plots:
no treatment on right; N, P, K, Na, Mg, and
silicate of soda on left.



K-1951 August 26, 1950
England. Rothamsted. Classical grass plots.
General view; left, no lime; right, limed.

August 28

This morning Mommy and I pack for the trip to Iceland this afternoon. We leave the Harpenden station about 1:20 p.m. and arrive at the Kensington Air Station in London a little before 3:00. Then we are told that our plane is delayed for at least 24 hours! It hasn't even left Iceland yet. Somebody is doing some plain and fancy lying about trying to call us, because they certainly didn't, although we left our number everywhere that it conceivably could be needed. The air station engages a room for us at the Scarsdale Hotel nearby.



August 29

In the morning we come to the Kensington Air Station to the office of G. Jonmundsson, who is very helpful in trying to get us onto a plane to Iceland. These Iceland planes are very confusing to strangers. There are two companies with one plane each, as I understand it. We were scheduled to go on Loftleidir (translated, Icelandic Airlines). The other company is Flugfelag (translated, Iceland Airways). The agent for our company finds it convenient to be away! Mr. Jonmundsson is agent for the Iceland Airways, and they have a chartered flight going after lunch with plenty of room. But he tells me that the British authorities will not give them clearance to fill this space, even though our plane has still not left Iceland. I call our Embassy and explain this ridiculous situation and ask them if they cannot do something to allow us to go on this plane. Whether this was the secret, I don't know, but in about an hour the permission is granted and we take a cab to the Northholt Air Station. But with this permission, it seems that they are also promising a ride to the Dutch Minister in Iceland, and now we have to wait for him to come from The Hague! The plane is chartered to take a group of Canadian seamen back to North America, and we are herded with the others in for lunch. And after lunch we wait most of the afternoon and get into the air at 5:08 p.m.

As we cross the Firth of Lorne I see rugged, striated mountains without trees and with considerable rock outcrop. The coastal strip

is very narrow and I see few houses and farms. I think I see Ben Nevis far to the east.

A little over 5 hours out, I see land again at the right, but it is too dark to see it clearly. It is partly covered with low, fleecy clouds, but large glaciers can be seen in the background. Numerous streams have braided deltas within the narrow coastal strip. Some of these have barrier bars in front of them. These are possibly the glaciers shown on the maps of southern Iceland. Just before landing, we pass over a dark-brown mass that appears to be volcanic.

We are down at Reykjavik at 10:56, British Time, or 9:56 Icelandic Time. Dr. Bjorn Johannesson is on hand to meet us, and we go through customs in a hurry. He takes us to the Hotel Borg and we are in bed by 11:00.



K-1952 August 30, 1950
Iceland. View in Reykjavik.



K-1953 August 30, 1950
Iceland. View in Reykjavik.



K-1953 August 30, 1950
Iceland. View in Reykjavik.



K-1953 August 30, 1950
Iceland. View in Reykjavik.



K-1954 August 30, 1950
Iceland. Reykjavik. High School.



K-1955 August 30, 1950
Iceland. Building of Althing.

August 30

We are up about 7:30 in a gray, overcast day. After breakfast, Mommy and I take a short walk along some of the principal streets. One has a little feeling of northern Russia from the houses -- from their color and style. The shops open very late; even the tobacco shops are not open by 9:00. Never have I seen such a density of little book stores in any city. There are far more of these than of any other kind of shop. Prices on everything seem to be very high, possibly because of money left over from the war. I talk with one storekeeper, and he tells me that economic conditions are now bad. To make things worse, the trawlers are all tied up at the dock because the fishermen are striking. He tells me that they have been tied up for two months and there is no prospect of settlement.^{1/}

Dr. Johannesson comes for us about 10:00, and we go to the Embassy where we meet Mr. Joseph Mendenhall of ECA, Mr. Sober, Assistant Commercial Attache, and Mr. E. Lawson, the Minister. We talk a bit about the possibilities of improving agriculture, and more specifically about the organization of the soil survey along with the other essential research services.

I am told that a general strike is threatened for September in protest against the government's cost-of-living index. It seems

^{1/} I am told later that the fishermen are objecting to a 16-hour day at sea, which does seem like a long day, but perhaps they don't need to go every day.

that labor was opposed to the last devaluation of the currency and were promised cost-of-living increases. The unions are apparently unwilling to believe the government figures. Evidence exists that communists are urging this strike, at least in places. Communists have about 20 percent of the seats in the Althing, but no party has a majority and the government operates under a coalition cabinet. It is curious that most of the fishermen of the trawler fleet on strike belong to unions dominated by the social democrats. A few locals that are communist controlled are not out on strike with the others now.

I get some pictures around the city and then have lunch with the Board of the Research Council. These include Dr. Bjorn Sigurdsson, Head of the Institute of Animal Pathology, Keldur; Mr. A. S. Geir Thorsteinsson, Director of the Icelandic Trawlers Codliver Association (a chemical engineer); and Mr. Thorbjorn Sigurgeirsson, Executive Secretary of the National Research Council.

With Dr. Johannesson, we have a general discussion of some of the agricultural problems. It is obvious that many subjects are in debate that could be settled with research -- the controversy about the importance of erosion, the emphasis that should be given to forestry, the place of small grains, the need for controlled grazing, and so on.

During the discussion, I get some definitions:

Tun refers to the fertilized grass fields around the farm headquarters.

Moar refers to mineral soils.

Sandar refers to denuded gravelly soils.

Myrar refers to peaty soils.

Holt refers to partly eroded land.

Although it is cold, windy, and rainy, we set out for a short field trip east and a little north of Reykjavik. One notices immediately that some of the land has an irregular stony surface pavement due to soil blowing, which probably started in the slip scars that healed too slowly because of overgrazing. I see some green oats and go by grassland cut twice for hay. I am told that this kind of land yields about 5600 pounds of hay per acre, but that good managers get twice as much.

I take a picture of the Reykir farm, that is regarded as a well-managed, top-class farm. Some barley and oats are being grown with the anticipation that they will mature. The soil is from nearly black basaltic ash and lava. It is about neutral in reaction. The soil is thin and stony on the hills with well-sorted alluvium in the valleys. Most farms are on this alluvium, which varies greatly in age.

Along here we see in several places the large pipe that brings hot water from the natural springs into Reykjavik for heating.

Van refers to the fertilized grass fields around the farm

headquarters.

Moar refers to mineral soils.

Sandar refers to stannous gravelly soils.

Mytar refers to peaty soils.

Holt refers to partly eroded land.

Although it is cold, windy, and rainy, we set out for a

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noticed immediately that some of the land has an irregular story

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slip scars that heeled too slowly because of overgrazing. I see

some green oats and so by grassland cut twice for hay. I am told

that this kind of land yields about 5000 pounds of hay per acre,

but that good managers get twice as much.

I take a picture of the Reykjavik farm, that is regarded as a

well-managed, top-class farm. Some barley and oats are being

grown with the anticipation that they will mature. The soil is from

nearly black basaltic ash and lava. It is about neutral in reaction.

The soil is thin and stony on the hills with well-sorted alluvium

in the valleys. Most farms are on this alluvium, which varies

greatly in age.

Along here we see in several places the large pipes that bring

hot water from the natural springs into Reykjavik for heating.



K-1956 August 30, 1950
Iceland. Hummocky grassland. (Rain)



K-1957 August 30, 1950
Iceland. Hummocky grassland. (Rain)



K-1958 August 30, 1950
Iceland. East of Reykjavik. Reykir farm.
Well-managed, top-class farm. Barley to right
of house with oats in front. In the immediate
foreground is the main hot water pipe to Reykjavik.



K-1959 August 30, 1950
Iceland. Reykir farm near Reykjavik.

We pass a wool processing factory at Alafoss.

Dr. Johannesson tells me that soils that become bare from slips or erosion return to grass very slowly indeed, unless nitrogen and phosphorus are used. The soil is especially low in phosphorus.

We drive on to the northeast and stop at a large farm with 36 milking cows. They produce about 3000 kilos of milk, with an average of 4 percent butter fat. These Icelandic cows are rather small. They are fed hay dried by hot air that is heated by hot water piped into the barn, and also silage from green oats. On this farm, some concentrate of maize and bran mixed with fish meal is used. Electric milking machines are used. (Perfection Milking Machine of Minnesota.) Essentially no bedding is used in housing the cows. The solid manure is pushed into a basement beneath the barn through little trap doors, and the liquid manure is collected in a separate tank.

Hay produced on this farm is made up mainly of bluegrass, red fescue, and white clover. Some of the newer fields contain timothy and foxtail in the mixture. One field has had some red clover in it for 11 years. There are no sedges in the mixture on the drained fields.

On this farm, barn feeding is stopped about the first week of June and begins again in the middle of September with green forage,



K-1960 August 30, 1950
Iceland. Inside of dairy barn near Reykjavik.
The solid manure is pushed into the basement
through small holes covered by boards.



K-1961 August 30, 1950
Iceland. Close view of large dairy barn near
Reykjavik.

although some grazing continues until about the middle of October. The milk from this farm is sold to the nearby sanitarium as whole milk, whereas nearby farmers sell to Reykjavik.

I also see here cabbage and potatoes, mainly for home use. Many of the cabbages have been harvested. I see other vegetables, including turnips and carrots.

I get a quick look at the soil in the cabbage field. There is a variable, rich, brown A_p of 6 to 8 inches over very dark brown to black gravelly and cobbly basalt.

We stop briefly by the greenhouses that are also heated from the hot water from the springs. The most important crop is flowers, especially carnations, although I see some cucumbers too. For soil in the greenhouse, they are using here sedge peat, which contains about 40 to 50 percent by weight of volcanic ash. The material is light brown to brown and almost felty. They mix this in a ratio of about $3/4$ peat and $1/4$ manure and add some lime and fish meal.

It continues cold, wet, and windy.

We stop for just a moment at a very large farm, perhaps one of the largest in Iceland -- equipped in the Danish manner. Unfortunately, the manager is not around.

Here they use about 70 pounds of nitrogen per acre for two cuttings on meadows where no manure is used, and about 250 pounds



K-1962 August 30, 1950
Iceland. Close view of large dairy barn near
Reykjavik.



K-1963 August 30, 1950
Iceland. Reykjavik. Inside of greenhouse
on rainy day. Cucumbers.



K-1964 August 30, 1950
Iceland. A few miles east of Reykjavik. An
area of nearly wasteland resulting from erosion,
mainly wind, probably accelerated by over-grazing.

of 20-percent P_2O_5 . The mineral soils appear to be fairly well supplied with potassium, and they use only 100 pounds of 60-percent K_2O . But the evidence is that farmers are not using enough of either potassium or phosphorus, especially phosphorus. This is partly because they have had poor results with phosphorus alone. Unfortunately, it is common for them to use only manure and say 30 pounds of nitrogen.

I try another picture a few miles east of Reykjavik on an area of waste land from erosion. This is mainly wind erosion, probably initiated from normal slip scars being increased with overgrazing.

We drive back to the hotel and I have a short nap before dinner at 7:00. Our room is very cold. Although one doesn't see much ice in Iceland, perhaps the "Ice" stands for something after all.

The landscape we saw today looks bleak and gloomy beneath the low, scudding clouds and through gusts of fine rain. It reminds me of something midway between the Aleutian Islands and western Wales.

We are to bed early for a big field trip tomorrow.





August 31

We start out early (for Iceland) on a trip that will take us well east of Reykjavik.

Our first stop is about 4 or 5 miles east of the main road crossing north of Reykjavik. The land is gently rolling to rolling and consists of basaltic ash. Much of the area has been badly eroded by a combination of slips (solifluction), running water, and wind. The cover is mainly low grasses with some sedges, mosses, and very small shrubby plants.

Sample I

A ₁₁	0-1"	Organic-rich, granular, surface soil, slightly darker than the soil beneath. Dries to peaty turf. (pH - 6.0) ^{1/}
A ₁₂	1-5"	Dark reddish-brown (5YR 3/3) light very fine sandy loam, softly and finely granular and held together by roots. Perhaps 20 percent organic matter. (Very dark yellowish-brown: 10YR 3/4) ^{2/} (pH - 6.0)
A ₁₃	5-8 $\frac{1}{2}$ "	Like the above, but fewer roots. (Dark brown to very dark brown: 10YR 4/3 to 3/3) (pH - 6.3)
A _{1b}	8 $\frac{1}{2}$ -9 $\frac{1}{2}$ "	Black to very dark brown light fine sandy loam; single-grain to granular. (pH - 6.6)
C	9 $\frac{1}{2}$ -52"+	Dark reddish-brown (5YR 3/4) light fine to very fine sandy loam; slightly firm, but very easily friable to fine soft crumb. (C ₁ taken at 14 inches and C ₂ taken at 36 inches.) (Dark yellowish-brown: 10YR 4/4) (pH - 6.6)

^{1/} pH in laboratory at Plant Industry Station on collected samples.

^{2/} When dry.



K-1966 August 31, 1950
Iceland. A view near location of first profile
described, showing erosion following slips.



K-1967 August 31, 1950
Iceland. A view near location of first profile
described, showing erosion following slips and
cracking of exposed surface.



K-1968 August 31, 1950
Iceland. Another view near location of first
profile described, showing erosion following
slips.

When exposed in the slip scars, this material becomes very fluffy. With cracking, an exceedingly friable surface layer about one-half inch thick is formed.

We drive on over a rolling area that has probably been glaciated. The drift consists of reworked dolerite and tuff covered by basaltic ash. Many of the volcanic rocks here erupted under the ice during glacial times. This soil is exceedingly erosive. In places, it is worked down to a nearly level grassy lava plain.

The hilly land to the side has many very shallow gullies stabilized by erosion pavements of basaltic and pumiceous stones and boulders. Slips are common, and many of these have been gouged out by the wind. Frost, water erosion, and soil blowing are combined together in many places. Soils having a base of tuff appear to be more erodible than those with a base of basalt.

We pass Koluidarholl and I get some more pictures of this combined action of frost, water, and wind. Where vigorous, the grass roots offer a good deal of protection.

We continue on over a rugged volcanic area covered perhaps about one-half with vegetation. Some of the lava is of the year 1000. We pass some hot springs used for heating nearby houses.

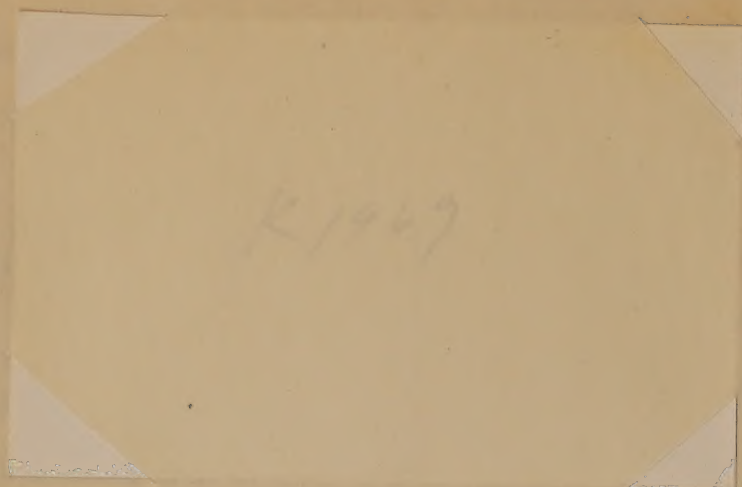
I get some more views of the lava flows, a little older than 1000 years, but still young and covered mainly with moss and scattered grasses and low shrubby plants.



K-1969 August 31, 1950
Iceland. Several miles east of Reykjavik. Sheep
on the margin of a lava plain.



K-1970 August 31, 1950
Iceland. Sheep in lava plain.

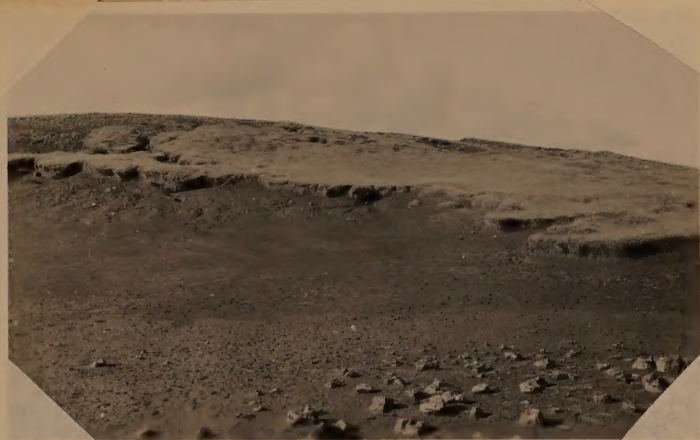


K 1947

K-1969 August 31, 1950
Iceland. Several miles east of Reykjavik. Sheep
on the margin of a lava plain.



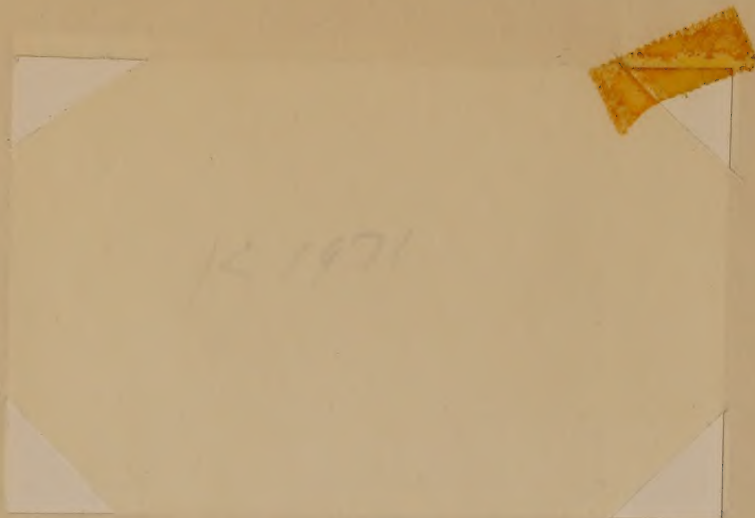
K-1970 August 31, 1950
Iceland. Sheep in lava plain.



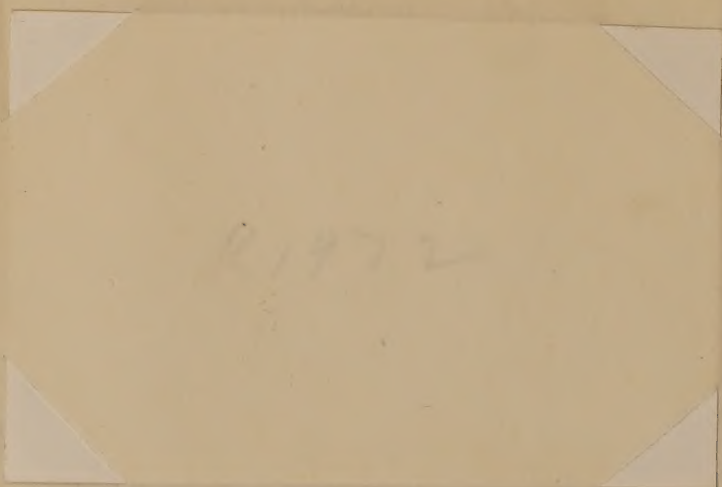
K-1971 August 31, 1950
Iceland. East of Koluidarholl. Erosion of
grassy tundra soil from wind-blown ash by frost,
wind, and water.



K-1972 August 31, 1950
Iceland. West of Hveragerdi. Young lava flows.



K-1971 August 31, 1950
Iceland, East of Keflavik. Erosion of
grassy tundra soil from wind-blown ash by frost,
wind, and water.



K-1972 August 31, 1950
Iceland, West of Hveragerdi. Young lava flows.

We come to Hveragerdi. This is the main center for the State Horticultural School, with greenhouses heated from the hot springs.

The lowland here is said to be of marine origin, partly covered with lava. Quite a bit of the land has been drained. Some of the old springs disappeared and new ones appeared during an earthquake only three years ago. In fact, a new hot spring came up through the floor of one house. I don't know whether the advantages outweighed the disadvantages or not.

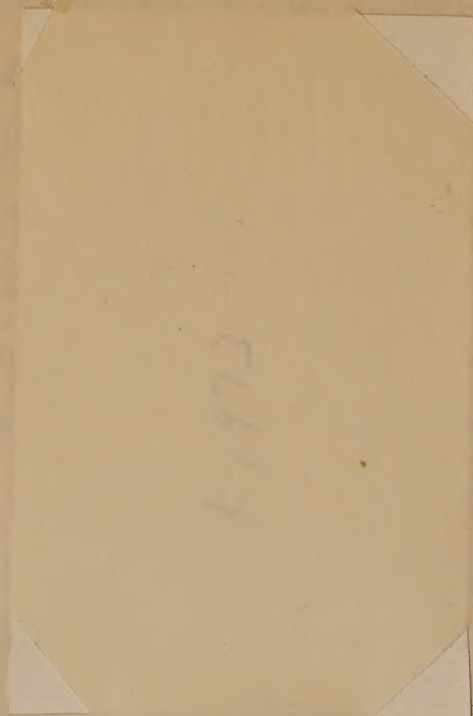
We look hurriedly at the greenhouses, and I am especially interested in banana production here. They are using a variety called Chinensis obtained from England. It is comparatively dwarf, say about 10 to 14 feet high, and only 12 to 14 months are required from a small shoot to ripe fruit. The house is only heated to 25° C since cucumbers are also grown. It is felt that bananas can be grown here practically for the luxury market, and a new house is being built that will be kept at 35° C. According to their calculations, they should have 200 to 300 individual bananas per plant and thus produce about 100 per square meter each 12 to 14 months. The bananas are small and run about 15 to the kilogram. Private growers have a few banana plants now. For the bananas, they use the local soil fertilized with liquid manure and mixtures of nitrogen, phosphorus, and potassium. Grapes are also produced and many flowers, especially chrysanthemums. They also have cucumbers and tomatoes. People in Iceland grow a great many flowers



K-1973 August 31, 1950
Iceland. Hveragerdi. Bananas in greenhouse.



K-1974 August 31, 1950
Iceland. Hveragerdi. New greenhouse for banana
culture under construction.



1973

K-1973 August 31, 1950
Iceland. Iversgard. Bananas in greenhouse.



K-1973 August 31, 1950
Iceland. Iversgard. New greenhouse for banana
culture under construction.

in their houses and buy a good many from the stores.

It begins to rain, and we drive on further east. In just a little way, I look at the soil. The upper part is like the first profile, but below 20 inches the soil is at pH 5.8, even though the surface is 6.5. Below 20 inches, the soil is well banded due to alluvial deposits and partly due to iron accumulations. Gleying is suggested at about 3 feet. This undulating soil on a terrace has good pastures, and a little further on I get some fair pictures, even though it rains.

The poorly drained brown soils on the low terraces are drained by open ditches. Most of the soil on the terraces is at least imperfectly drained.

We pass a field of good-looking oats on a smooth, drained terrace. In this area the State has a drainage scheme and sells the drained land for farms. I stop to look at a soil in a smooth plain that was moderately wet before drainage.

Sample II

- | | | |
|-----|---------|--|
| (1) | 0-4" | Dark reddish-brown turf and very fine sandy loam. I estimate that the material is about 30 percent organic matter, although it looks like peat. |
| (2) | 4-22" | Reddish-brown, springy, fibrous peat, with perhaps 50 to 60 percent ash. |
| (3) | 22-72"+ | Dark brown sedge peat with some mineral matter. The material has noticeable banding from ash showers and from changing water tables. The water table is now at 6 feet. |



K-1975 August 31, 1950
Iceland. East of Hveragerdi.



K-1976 August 31, 1950
Iceland. West of Selfoss. Oats where peat
soil (No. 2) was sampled. (Mrs. Kellogg)

Two samples are taken of the third layer, one at 36 inches and one at 60 inches.

According to Dr. Johannesson, the soil is about pH 5.2 in the surface and about 5.5 in the lower part. These soils are a bit too wet and a bit too acid for the best crops, and it is very difficult to get lime for them. Some of the farmers maintain that animals do not relish the grass from these soils. I have no doubt that the grasses are low in minerals.

We come to Selfoss and have lunch, and then pass over a large smooth plain with lava at about 30 to 90 inches. There are a few nice farms here. I try to get some pictures of the farms and the characteristic microrelief. Although the farms run about 200 hectares each, perhaps, the good fields of hay and oats (tun) are small.

The lava here is generally smooth and thin, but there are a few outcrops. Many of the farm houses and barns are built on the high rocky spots to avoid the occasional inundations.

Further east, we cross an alternative outlet of the main river (Hvita ?) used to inundate the level land. These inundations deposit some glacial flour. Here the soils are higher in pH at the surface than underneath, possibly from sediments from the stream and possibly from wind deposits. Here too, I see some houses built on outcrops of lava with the grass fields (tun) around them.



K-1977 August 31, 1950
Iceland. West of Selfoss. View where peat
soil (No. 2) was taken.



K-1978 August 31, 1950
Iceland. West of Selfoss. Drainage ditch in
peaty soil at site of profile No. 2.



K-1979 August 31, 1950
Iceland. East of Selfoss. Ordinary farm.



K-1980 August 31, 1950
Iceland. East of Selfoss. The normal surface
of fairly well-drained mineral soil.

In the ditches, one sees lots of iron that has come out of solution. Oats and potatoes are grown here, and cattle are grazed on the grass growing on the peaty soil.

We cross the Thorsa River, said to be the largest in Iceland. I photograph a farm just by the river. The approach to the bridge is a steep grade, and a workman is sodding the bank with almond-shaped sods cut from wet, peaty, mineral soil.

We continue east and I get some more pictures showing the drainage ditches on the slopes. The State pays about two-thirds of the costs for these drainage improvements.

I stop to look at the soil near one of these drainage ditches. The upper 4 inches here is said to be about pH 6.1, and at 3 feet about 5.5. Loss on ignition at 3 feet is 32 percent; and in the surface, 26 percent. Field examination does not suggest such very low figures. Although some volcanic ash may be seen in the profile, it doesn't seem to have very much direct influence on the character of the peat. I am told that few of the peats in this region exceed 60 percent loss on ignition, but that in the very western part of the country, some are as low as 10 percent ash.

Dr. Johannesson tells me that the peat soils are better when drained if the peat is only 1 meter over the rock rather than deeper. Here deep peat lies over old marine deposits.

I photograph a farm house near the little brook, Raudi Laekur, which has still left one of the old sodded houses.



K-1981 August 31, 1950
Iceland. Near Thorsa River east of Selfoss.
Sodding road-fill bank with almond-shaped sods
cut from wet mineral soil with peaty surface.



K-1982 August 31, 1950
Iceland. Near Thorsa River east of Selfoss.
Characteristic farm buildings.



K-1983 August 31, 1950
Iceland. East of crossing of Thorsa River. New
drains laid out on farm.



K-1984 August 31, 1950
Iceland. East of crossing of Thorsa River. A
drainage ditch in peaty soil just being reclaimed.

I also photograph an improved meadow -- improved by drainage, plowing, seeding, and fertilizing. Along side, the land is not yet improved. Mole drains have just been installed in lines 5 meters apart. Yet even this improved pasture needs considerable more fertilizer, including nitrogen.

We continue east and pass Hella (Helluvad ?). At first we are on gently rolling mineral soil, but soon are into a gently undulating plain that is essentially bare. Many of these badly windswept areas probably got to eroding as a result of very hot showers of pumice ash that killed the vegetation. Here perhaps 6 to 8 thousand hectares are nearly barren. The material consists essentially of very dark brown gravelly light sandy loam. Much of the area is nearly flat, but some is undulating from soft dissection.

We stop to look at an experimental field of barley and oats planted in this barren, gravelly soil. This is at the margin of one of the four State experimental farms managed by a group of five people.

No tillage has been necessary, only seeding with fertilizer. They have used here per hectare 240 kg. of 45-percent superphosphate, 130 kg. of 60-percent muriate of potash, and 210 kg. of 33-percent ammonium nitrate. This is the third year of grain. It looks fairly good, except near the edges where the wild geese have fed on it,



K-1985 August 31, 1950
Iceland. Raudi Laekur farm.



K-1986 August 31, 1950
Iceland. Raudi Laekur farm. Improved meadow
at right -- drainage, plowing, seeding, and
fertilizing; unimproved at left with mole drains
recently installed 5 meters apart.

and will certainly mature. Yields of grain run about 2000 kg. per hectare.

At the start, at least, these soils are fairly well supplied with potassium and are very low in both nitrogen and phosphorus. This exceedingly low phosphate content has a lot to do with the barrenness. A certain amount of slipping and other erosion is inevitable. On most soils, the bare places quickly heal; but not here where phosphorus is so deficient.

I look at the soil on this flat where it has not been fertilized.

Sample III

At the very surface is a desert pavement of pebbles.

- | | | |
|----------------|---------|--|
| A | 0-16" | Nearly black, nearly loose, gravelly light sandy loam. (Dark gray to dark grayish-brown: 2.5Y 4/1) |
| D ₁ | 16-18" | Brown ash. (Not sampled.) |
| D ₂ | 18-24"+ | Dark brown sandy loam. (Appx. dark yellowish-brown: 10YR 4/4) |

We go on through the village of Hvolsvöllur and come into a more densely populated valley. I see several good farms. I get some kodachromes of characteristic farms, including one that is furnished by the State to the pastor. The State furnishes him the farm and maintains the church. In addition, they give him a salary. It is said that these pastors do not need to worry much about whether people come to church or sweeten the collections.



K-1987 August 31, 1950
Iceland. East of Hella. View of eroded pumice
ash with erosion pavement.



K-1988 August 31, 1950
Iceland. East of Hella. View of eroded pumice
ash with erosion pavement, with some dissection.



K-1989 August 31, 1950
Iceland. East of Hella. Eroded pumice ash:
right, barley; left, a nearly barren "sandar."



Views of eruption of Mt. Hekla in 1947.

I get some pictures of hay in cocks. Most of the hay here is cut by hand and put into cocks after it is nearly dry. These are given a little canvas cover for the very top. On some of the imperfectly drained soils especially, it is very difficult to cut the grass because of the microrelief. The number of days of good drying weather is small. Yet hay is perhaps the principal crop.

We stop at an experimental farm -- Samsstadir -- and first go into the Director's house for tea and cakes (Mr. K. Kristjansson). The interior of the house is filled with house plants, books, pictures, and embroidery. The Director strikes me as a very energetic man. On the low-lying fields, for small grains he uses per hectare 150 kg. of 45-percent superphosphate, 100 kg. of 60-percent muriate of potash, and 200 kg. of calcium nitrate. (I look at these fields later. They are on imperfectly drained grassy Tundra from alluvium. The surface is a very fine sandy loam with a peaty cover in places.) The Director is quite enthusiastic for small grains in Iceland. He has demonstrated that they can be grown; of course, it is nip-and-tuck on ripening and for safety one should have a drier. He says that increasing the nitrogen any further is likely to lead to lodging and delayed maturity. This year he expects 2500 kg. per hectare of barley and 3000 of oats. He has had as high as 4000 of barley. Last year he had only 1100 kg. per hectare. About 1 year in 10, he says, there is very little crop because of cold wind and rain. He says he has also



K-1990 August 31, 1950
Iceland. Samsstadir. Hay on somewhat peaty soil.



K-1991 August 31, 1950
Iceland. Samsstadir. View of experimental grass plots.

made 140 metric tons of hay on this farm and plans to have 25 tons of dehydrated grass from 38 hectares.

We go out and look over some of his experimental plots, including a great many trials of small grains and also of grasses with different rates of fertilization. These are on fairly rolling soil quite a bit like the first one examined today, but without the erosion. I also see some vigorous little Sitka spruces. We drive over on the south side of the road, out into green fields on the low bottom, which is intermediate between Alluvial soil and grassy Tundra. (K-1994)

A _p	0-7"	Dark reddish-brown (5YR 3/2) silty very fine sandy loam. The soil digs out in irregular blocky that is very easily friable. Plastic when rubbed.
B ₁	7-15"	Dark reddish-brown to reddish-brown (5YR 3/4 - 4/4) very fine sandy loam. Slightly firm, but easily friable to soft fine crumb.
G	15-20"+	Mottled yellowish-red, strong brown, and red silty very fine sandy loam.

In nearby spots, the soil has a thin peaty surface, but the small grains are growing on the better-drained parts. In the imperfectly drained, nearly level areas, there is a well-developed microrelief with mounds 6 to 8 inches high, 24 to 30 inches across, and about 6 to 10 feet apart. The soil varies from a silt loam to a fine sandy loam. It is very dark brown in the mounds and in the upper 3 or 4 inches between the mounds. Beneath, it is reddish-brown. The soil is fairly high in organic matter, but not enough



K-1992 August 31, 1950
Iceland. Samsstadir. General view of experimental farm.



K-1993 August 31, 1950
Iceland. Samsstadir. Sitka spruce 3 years old when planted and 5 years in place. (Superintendent - Mr. K. Kristjansson)



K-1994 August 31, 1950
Iceland. Samsstadir. Oats on alluvial soil.
(Superintendent - Mr. K. Kristjansson)



K-1995 August 31, 1950
Iceland. East of Samsstadir. Characteristic
microrelief on imperfectly drained soil midway
between grassy Tundra and Half Bog. Cocked hay
cut by hand.

to be a Half Bog. There is a strong turf, and roots go down to 20 inches or more. The soil is well mottled in the lower part. I should need to regard this as grassy Tundra without permafrost. The soil examined here goes with the picture of cocked hay and microrelief. (K-1995)

It is said that one man can cut a ton of dry hay in a day; but that scarcely seems possible to me. I notice here that even where mowers could be used on many of the smooth fields, most of the grass is cut by hand.

We drive on to Mulakot for the night and stop at a little country inn. This was once the location of the forestry station, and I see some nice mountain ash 38 to 50 years old and some Sitka spruce up to 15 years old. There are also some nice flower gardens.

We are early to bed in a cold room.

September 1

After a good sleep, I am up early for a walk in the garden and tree plantings. It is quite cold. We have breakfast and leave about 8:40, going back west over the road we traveled last night. After a mile or so, I stop to look at a cut in a nearly level, fairly recent terrace. A thin layer of coarse gravelly pumice scarcely covers the surface.

- | | | |
|----------------|--------|--|
| A ₁ | 0-4" | Dark reddish-brown (5YR 3/4) light very fine sandy loam. Firm, but easily friable. Probably brown when dry. Dr. Johannesson estimates the loss on ignition as 9 percent. |
| C | 4-48"+ | A series of layers 1/4 to 1 inch wide, made up partly of water deposits and partly of ash and fine cinders. |

Drainage is good here. Roots go to 4 feet, but most are in the upper 12 inches. The soil is about neutral throughout. Although a young soil, there is somewhat more organic matter and more compaction in the upper part than in the lower. Since the light is fairly good, I try for some pictures of the landscape here, including a view across the braided bed of the Thvera River, now diked to the east to prevent further cutting away of the good soils on the bordering terraces.

We continue on west over the same road. We turn north a few miles west of Mulakot to the forestry station now about 3 years old. Here they are developing nurseries and a few small plantings. Some of the poplars from Alaska are grown inside, under glass, and



K-1996 September 1, 1950
Iceland. Near Mulakot. A section along a
stream bank showing complicated layering of
ash showers reworked by water.



K-1997 September 1, 1950
Iceland. Near Mulakot, looking from hayfield
on stream terrace to hilly land with oats in
middle background.



K-1998 September 1, 1950
Iceland. Near Mulakot. View across old
braided bed of the Thvera River, now diked
to prevent cutting.

they have many beds of Sitka. They tell me that they hope to have a capacity of about 1,000,000 seedlings per year. It seems to me they are going into this Sitka program too fast ahead of their research program and experience.

I look at some Sitka about 9 years old that have been in place 4 years on a hillside. Some have died, especially where the soil is wet from seepage. The little trees apparently suffer a good deal from competition with the wild grass that grows tightly around them.

We leave the station and drive west over a large plain made up from windblown ash. The turf is heavy, but not peaty. The surface is a very dark brown silty very fine sandy loam underlain with coarse cinders at around 18 to 20 inches. The soil looks to be well drained, and the pH is 6.5. There is a relatively low percentage of grass in the turf, and the color is not very good. I suspect that perhaps the only thing wrong with this soil may be extreme phosphorus deficiency. On the old house sites there is more grass and it has a strikingly green color. Then there are a few other small mounds with green, vigorous grass, probably built up by roosting birds.

We turn off the main road and take the road to Keldur, first over the barren plain of cinders where we saw the barley plots last evening. Part-way out we pass some conspicuous stabilized dunes of volcanic ash and cinders. The stabilizing grass is an Elymus. We go on through a large area of windswept land. Part of



K-1999 September 1, 1950
Iceland. At forestry station near Mulakot.
Sitka spruce seedlings in outdoor nursery
protected from heaving and cold by turf.



K-2000 September 1, 1950
Iceland. At forestry station near Mulakot.
General view of nursery.



K-2001 September 1, 1950
Iceland. At forestry station near Mulakot.
Sitka spruce 5 years in nursery and 4 years here.



K-2002 September 1, 1950
Iceland. Southwest of Keldur. Dunes of volcanic
ash and cinders stabilized by dune grass. (Elmus)

it is nearly level with a desert pavement. Other parts are rolling that have an uneven lava base. That is, the wind has removed all of the covering ash over the lava in many spots.

We come to Keldur farm like coming to an oasis in the desert. The pastures are well kept and bright green. Besides the modern farm house, the old buildings in the style of the 12th century have been preserved and maintained.

As we leave Keldur, I try to get pictures of the junction of this badly eroded area with the uneroded land next to the good farm. Certainly this is an excellent demonstration of what manuring and controlled grazing can do in land stabilization. Besides, the nearby mountains probably protected Keldur farm from the worst force of the winds.

I am told that this broad area near Keldur began to erode some 150 or 200 years ago and is only now becoming stabilized again.

We drive along country roads, generally northwest, to a State farm, Gunnarsholt, devoted to soil improvement work. This farm lies just beyond the worst eroded area. They have had some successful experiments with grass, small grains, and potatoes on the eroded sandy plains, if fertilized.

We talk for a few minutes with the Vice-Director of the station, Mr. P. Sveinsson. He has been in the United States and brought back several kinds of grasses. He thinks that brome grass is the best. One of the poas he got from western Oregon is good, but seeds



K-2003 September 1, 1950
Iceland. Keldur farm. Farm buildings maintained in style of 12th century.



K-2004 September 1, 1950
Iceland. Keldur farm. Early style barn still in use.



K-2005 September 1, 1950
Iceland. Keldur farm, looking across pastures
to mountains.



K-2006 September 1, 1950
Iceland. Between Hella and Selroos. Charac-
teristic slips on upland soil.



K-2040 September 1, 1950
Iceland. West of Keldur Farm. Wind erosion
working into good land.

very poorly. He says that canarygrass does fairly well. Many of the native species of fescue are good. He thinks that it is possible to get all of this bare, sandy area covered in time.

He feels that fencing will be necessary in order to control the grazing, and that with fencing a lot of the area wouldn't need reseeding. He tells me that in the whole country there are about 75,000 hectares under fence, with 15,000 to 20,000 of these in the area about this farm. Dependable seedings require nitrogen and especially phosphorus fertilizers in the worst situations. He is quite enthusiastic about brome grass (Bromus inermis). It is difficult to get seed, which must be imported. This brome will support sheep, if carefully grazed.

I suspect that there is an unrealized danger of generalizing to the whole of Iceland from this one farm with its unique combination of soil and climatic conditions.

We chat for a few moments about the Iceland cattle. Although hardy, they are very mixed in color, form, and milk production.

We go on back to Hella for lunch. After lunch, we drive on west over the same road. I stop again to look at some of the mounds. As one digs down to the essentially unaltered ash, it is clear that the ash layer itself has been raised. Its upper boundary is roughly parallel to the surface. They resemble the micro mounds in Alaska and are probably due to combinations of frost heaving,

thickening of the A₁ by dust accumulation, and tramping by grazing animals.

Between Hella and Selfoss, I try another picture showing the effect of solifluction -- the slips with mounds and scars.

We return to Selfoss and turn north toward Thingvellir. A little way north, I get some pictures of old-style farms between the road and the sharp escarpment to the west. We continue along this road and then cross the river and enter a plain with knobby relief. The soil is shallow and dark reddish-brown from ash over basaltic lava. There is about a 50-percent stand of dwarf birch some 1 to 4 feet high, with scattered grass and dwarf shrubs. Some of the bare places, the old slip scars, are subject to soil blowing, perhaps partly accelerated from fairly heavy sheep grazing. After two or three miles of this, we pass into gently rolling grassland with slip scars on the hills and come to the main power station, Sog, on the Sog River.

A little further north, I try to photograph an excellent example of accelerated erosion due to overgrazing on the shore of Lake Ulfjotsvatn -- a part of the Sog River system.

We continue on north over choppy, undulating plains of fairly shallow soil with little rock outcrops. It seems to me that this land has probably been rather badly overgrazed. Even here there are some bare slip scars. On the mountain slopes there are many slips and bare spots.

thickening of the Δ_1 by dust accumulation, and trapping by grazing animals.

Between Hella and Salfos, I try another picture showing the

effect of soilification -- the slope with mounds and scars.

We return to Salfos and turn north toward Thirveviller. A

little way north, I get some pictures of old-style farms between

the road and the sharp escarpment to the west. We continue along

this road and then cross the river and enter a plain with knobby

relief. The soil is shallow and dark reddish-brown from ash over

basaltic lavas. There is about a 50-percent stand of dwarf birch

some 1 to 1.5 feet high, with scattered grass and dwarf shrubs.

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K-2007 September 1, 1950
Iceland. North of Selfoss. Old-style farm
buildings.



K-2008 September 1, 1950
Iceland. North of Selfoss. Another close
view of old-style farm buildings.



K-2009 September 1, 1950
Iceland. Near Lake Ulfjotsvatn. Characteristic
erosion, probably accelerated by overgrazing.

Beyond the small mountain (Midfell ?), we stop to look at the soil. It is a shallow one from fairly recent lava with an interrupted cover of dwarf heather, cranberry, moss, blueberry, and some grass. I get some pictures that are characteristic of this kind of terrain. (K-2010, 2011, and 2012)

It begins to rain. As we approach the northern shore of the lake, the soil is about like that behind us, except that it is somewhat more rolling.

We continue on around the lake to Thingvellir -- the famous early meeting place of the Iceland Chiefs where the Althing began. The plain is in a rift valley between roughly parallel great fault cracks. I try for pictures, but the weather is very bad.

We have tea in the hotel and then start back toward Reykjavik, driving southwest from Thingvellir. First we go over some upland that appears to me to be overgrazed, but it is impossible to tell how much of the erosion is entirely natural and how much accelerated. Soon we are on a high, rolling plateau at 700 to 800 feet, with much less erosion. Here there is a fair cover of mosses, very low shrubs, and grasses, with sedges in the low places. There are numerous small ponds. The land is used for sheep grazing, but the carrying capacity must certainly be rather low. It is cold, raining, and dull as we drive on toward Reykjavik. About 6 miles out, I try again to photograph some of the slips, and then take some pictures near the harbor, where the car fails us for the moment.



K-2010 September 1, 1950
Iceland. Southeast of Thingvellir. General
view of shrub-covered soil in rather recent lava.



K-2011 September 1, 1950
Iceland. Southeast of Thingvellir. Another
close view of shrub-covered soil in rather recent lava.



K-2012 September 1, 1950
Iceland. Southeast of Thingvellir. Native
Iceland birch.

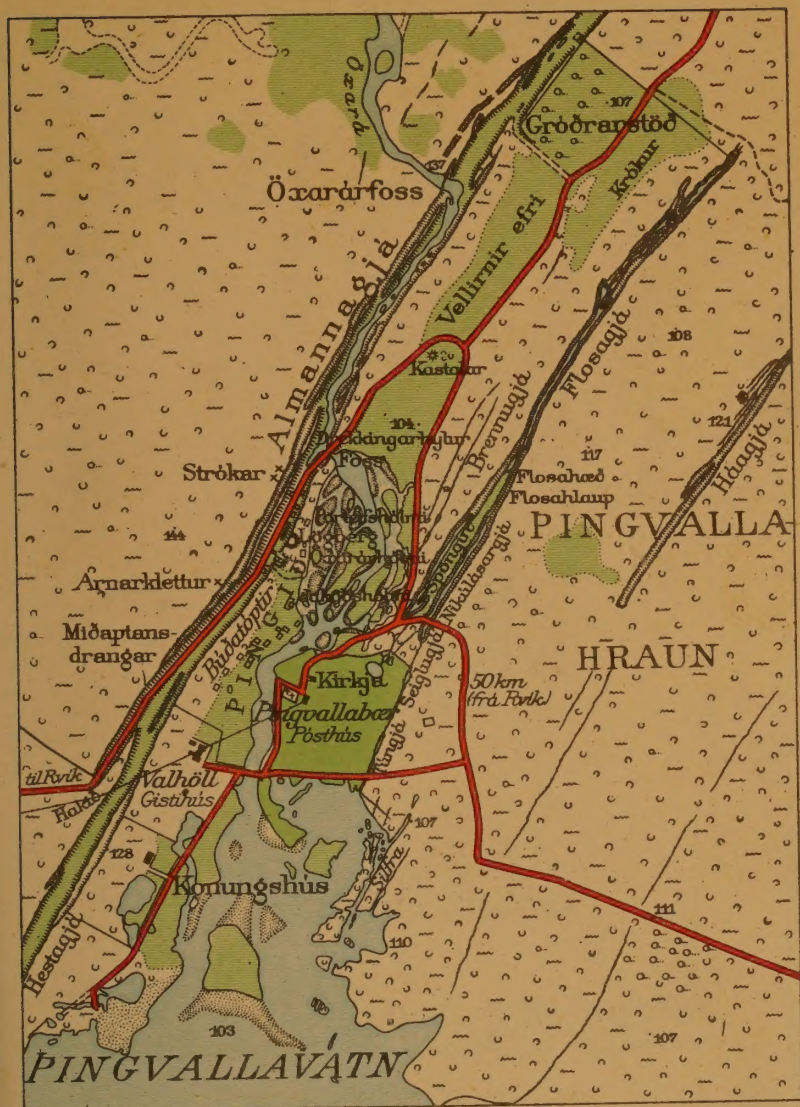


K-2013 September 1, 1950
Iceland. General view of Thingvellir, looking
east.



K-2014 September 1, 1950
Iceland. Thingvellir. Fault on north side.

ÞINGVELLIR





K-2015 September 1, 1950
Iceland. About 6 miles east of Rekjavik. Mounds
in foreground, slips on the slopes.

We are back to the hotel at 7:30. In the evening Dr. Johannesson and I discuss the observations made by Olaf Aamodt last summer and other needs of Icelandic agriculture. I find that I am expected to develop a report for the guidance of the Minister of Agriculture.

Added later: This report was prepared immediately after my return to the United States in the form of a memorandum to Mr. H. Jonasson, Minister of Agriculture, from me, under date of September 11, 1950, with the subject "Soil survey and correlative research in Iceland," as follows:

This memorandum is in response to the suggestion that impressions from my recent visit may be helpful in planning soil research and related research in agriculture. I wish to thank you, and through you, the others, especially Dr. Johannesson, who made my short stay in Iceland so pleasant.

I. Examples of major problems of soil use.

Iceland has large areas of soils suitable for more intensive use in improved pasture, hay, and cultivated crops. Full and efficient use of these soil resources will require increasing investments in drainage, fencing, lime and fertilizers, machinery, seeds, and other materials. The soils vary widely in slope, depth, texture, content of organic matter and plant nutrients, and other characteristics that determine their drainage, erodibility, productivity, and management requirements.

Several problems suggest themselves after even a hasty glance at the soils and farms:

1. Which of the poorly drained peaty soils can be drained effectively to produce good improved grassland, and which should be avoided? Obviously there are wide variations that need to be taken into account, if large sums are not to be wasted in draining unresponsive land.

2. How do the several types of soil vary in their response to lime, phosphate, nitrogen, and potash? Some experience has been had both experimentally and on farms, but this needs to be expanded and related to defined types of soil in order to make possible specific recommendations to farmers and in order to be able to select only responsive soil that will give economic yields for new arable land.

Until better sources of lime are developed so it can be made available cheaply, the most acid soils will need to be avoided. Then too, cheaper sources of abundant nitrogen and phosphate are needed, especially of the concentrated sorts that are most cheaply transported.

3. Opportunities for increasing cereal production, especially barley and oats, appear good through the combined result of (a) selecting the earliest-warming, well-drained soils; (b) adding the fertilizers needed for rapid, early growth and for quick maturity; and (c) sowing the earliest-maturing varieties suitable for Iceland. Success with cereal growing may be had most easily, at first at least, on large farm units that can be mechanized for seeding, harvesting, and drying, where large areas of suitable soil types exist.
4. Under what conditions of soils and exposure, and of cultural practices, are useful species of forest trees likely to succeed? Although efforts to produce trees are emotionally appealing, the large production of seedlings and plantings should only follow reliable research results indicating the types of trees and site conditions where reasonable success may be expected. Otherwise, large sums may be wasted before satisfactory methods are in hand.
5. Obviously there is considerable erosion in Iceland. The important questions are: (a) what proportions are natural and what accelerated, and (b) how should land use be regulated for optimum production? Speaking generally, one sees four principal sorts of erosion with two or more sorts often going on together: (a) the slips and slides on slopes resulting primarily from frost actions and extreme moistening, (b) soil blowing of dry soil on plains and in exposed places on slopes, (c) washing by water on slopes and shallow gully formation where the water is concentrating in weakly protected or barren places, and (d) the cutting along banks of streams that flood wildly during periods of snow melt and heavy rain.

A large part of this erosion is the result of normal geological and soil-forming processes. It is inevitable that steep slopes, built by geological activity, shall be reduced. As streams build up deltas, shifting beds and water courses must be expected. In some places these movements may be practically controlled by dikes and rip-rap, but in most places they cannot be controlled economically. In some places the development of alluvial fans may even be helpful.

Anything that weakens the vegetation on soil, even seasonally, may so increase its exposure to wind, running water, and frost action as to cause accelerated erosion. A fall of hot ash does this. Excessive grazing by cattle or horses, and especially by sheep, does so. On strong slopes in such a country, it is normal for frost action and heavy rain to cause slips down the slopes that leave exposed, bare soil behind them. Normally these are gradually covered again by grass and shrubs; but excessive grazing may prevent this revegetation with the result that the number and size of slip scars increase. During dry periods, more soil material may be whipped out by the wind; and where running water gets concentrated in these bare places, gullies form. The final result is continued erosion until a protective layer of stones and pebbles forms on the surface or until the underlying lava is exposed. Then the erosion stops and vegetation again appears, but often a far poorer vegetation on a far poorer soil.

Of course, the control of erosion is not an end in itself. We are concerned with reducing erosion when its reduction leads to increased production in the future or to reduction in damages from sediments in the lowlands.

Superficial examinations of eroded slopes will not reveal how much of the erosion is normal and how much accelerated. Some soil types erode far easier than others. On many soils it is highly important to control accelerated erosion -- to adjust grazing intensity to the optimum carrying capacity of the soil. Where overgrazing stimulates erosion, of course, the carrying capacity steadily goes down until finally grazing becomes impracticable. On the other hand, reduced grazing will not reduce the normal erosion, which may be quite conspicuous on certain soils, especially young soils on steeply sloping, soft volcanic ash, for example. By studying the upper soil layers and the vegetative cover on several examples of each specific type of soil with different management

histories, the grazing capacity and normal erosion conditions can be definitely established. Only in this way can the optimum grazing standards be realized that will insure full use of the range without deterioration. The problem of fencing will need to be met for proper grazing control.

Vegetative cover is also weak on many soil types and slow to return after erosion, because of extremely low soil fertility. It has already been established that many of the soil types in Iceland are extremely low in available phosphorus. The development of good pastures on these soils depends upon the use of fertilizers. Probably on many farms, the intensive fertilization and reseedling of a relatively small proportion of the pasture land would be far more economical than any attempt to improve the whole of it, except by reduced grazing. If a reasonably good source of phosphatic fertilizer is available, it may be entirely practicable to fertilize some of the ranges on responsive soils with airplanes as has been worked out successfully for hill pastures in New Zealand.

6. The various types of soil vary widely in their adaptability to grass, cereals, and potatoes, and in their management requirements for these crops. Perhaps the need for discovering the adaptability of individual species and strains of the grasses is much less appreciated. Then too, it must be continually recalled that a strain that proves to be superior on one soil type in one part of the country may not be the superior one on another soil type or in another part of the country. Since grass seeds are such a large item of cost (and in foreign currency), strong efforts need to be made to discover which species, varieties, and strains are adapted to the various kinds of soil in the country. Otherwise, large sums will continue to be spent for grass seed that never grows into grass. Based upon these research results, when available, dependable seed certification systems should be installed either by the government or by the agricultural cooperatives.
7. With modern methods of fertilization, use of silos (especially the cheaper trench silos), and perhaps increased drying of hay based on hot water, coal, oil, or electricity -- whichever is cheaper in a particular area --, the amount of good-quality winter feed can be increased enormously in Iceland. These winter-feed supplies need to be balanced against the pasture to avoid inefficient use or overdraft on either. It must be recalled that the unimproved range available to many farmers is already completely stocked or even overstocked. Thus, an

increase in winter feed without a corresponding increase in improved pasture might lead to serious overgrazing and erosion on the range. With increases in winter feed and improved pasture, it may be most economical for many farmers to include beef cattle rather than to increase dairying beyond the family labor supply, and to leave the sheep numbers at what can be carried on the available range.

8. Apparently Iceland farms have become much less family subsistence units and much more business units during a comparatively few years, with cash outlays for fertilizers, grass seeds, machinery, fuel oil, and other materials. As farms thus take on more of the characteristics of business firms, farm management plans need to include a budget of anticipated costs and income based, in turn, upon the best combination of production practices. It is especially in the development of such plans that soil scientists and other agriculturists can work with economists and with the farmers to the greatest advantage, first in analyzing farm experience to see what enterprises are most efficient according to soil type and soil management practices as related to size-of-farm, location, skill and resources of the farm family, and so on, and secondly, to help farmers work out the most economical combination of practices and enterprises to fit their particular situations. Combined studies of the results of experimental field trials and of farm record books in relation to the soil types on the farm, for example, give the basic data needed to establish dependable estimates of crop yields and carrying capacity of pastures and of the management requirements of the different types of soil about which farmers need recommendations. It is recommended that efforts be made to encourage the cooperation of a few representative farmers in keeping such detailed records by fields and enterprises. Soil maps should be made of such farms so that the data may be precisely related to the different kinds of soil and the results extended to other farms having similar soils.
9. Efficient soil use in Iceland, as in other northern areas, will depend enormously on cheap and dependable sources of commercial fertilizers in order to raise the general level of soil productivity far above that of the natural soil type, to lengthen the effective growing season by rapid, early spring growth, and to hasten the growth of cereals and other crops during the period of long days with abundant light.

Nitrogen is essential for good grass production. It is especially important to have supplies of this nutrient in the soil early, while it is still cold and before bacterial

action is releasing soil nitrogen from the soil organic matter. Until that happy day when Iceland farmers have a dependable supply of seeds of adapted legume forages, nitrogen fertilizers will be needed to maintain high production of both pastures and meadows. On some farms it may be more economical to maintain the production of grass with nitrogen fertilizer, even though legumes could be grown. With abundant electric power, ammonium nitrate production in Iceland seems to be entirely practicable. It is a concentrated material with relatively low transport cost, and the nitrate form is immediately available even with low temperatures.

Phosphatic fertilizers are also urgently needed. The most economic source might be the shipment to Iceland of rock phosphate, say from Florida, North Africa, or the Soviet Union, and its manufacture into soluble forms through the use of the electric furnace as done by the Tennessee Valley Authority (USA). It might be practicable to combine the electrical processing of ammonia and phosphoric acid to produce diammonium phosphate -- a highly concentrated material that could have a wide use in Iceland.

The possibility of local sources of agricultural lime needs full exploration.

II. A proposed soil survey program for Iceland.

It is recommended that a soil survey program be started as soon as possible, but on a small scale at first. Although soil surveys are essential and are urgently needed for the planning of land reclamation, crop land expansion, fertilizer recommendations, and the like, they must be based upon facts, many of which need to be painstakingly "dug for" in the field and the laboratory. The work requires (a) a relatively high degree of specialization, (b) close cooperation with specialists in soil chemistry, plant nutrition, botany, and geology to collect the relevant basic facts, and (c) close cooperation with specialists in agronomy, range management, forestry, horticulture, and farm management in order to develop sound interpretations in terms of yield, management requirements, and farm plans.

1. A professionally trained man in geology or in geology and chemistry may be sent to the United States for practical training in soil survey methods, partly by study at a university like Cornell and partly by work in a going soil survey party in the field. A period of at least 6 months would be desirable, and one of not less than 3 months necessary.

2. Shortly after the return to Iceland of such a trained man, a senior staff member of the Division of Soil Survey of the United States Department of Agriculture, widely experienced with northern soils, could come to Iceland for a period of about 2 months to help Dr. Johannesson get the program underway.

3. Technical procedure.

(a) As a first step, an approximation of a broad map of soil associations in the whole country could be compiled from existing sources on the basis of maps and other data dealing with climate, geology, relief, vegetation, agriculture, and the like.

(b) Using this compiled map as a guide, representative areas in the major soil associations should be chosen for detailed soil classification and mapping. Such areas should, where practicable, include existing experimental and demonstration farms as well as several established farms. They might vary in size from 10 to 30 square miles.

(c) As the field study of the soil progresses, soil samples may be taken for laboratory examination, including exchangeable cations, mechanical analysis, pH, content of organic matter, and the like. The results of field experiments and of farm experience may be related to the soil types. Then, besides, the boundaries shown on the first compiled map may be corrected and the descriptions of the soil areas expanded on the basis of the information gathered in the detailed work.

(d) With the completion of a few important sample areas, the first bulletin may be prepared. It should contain the revised, broad soil association map and the detailed soil maps of the sample areas. For each of these, a complete set of descriptions of all the soil types needs to be given and keys to their identification in the field by agricultural advisers who are not soil specialists developed. Besides, as full a set as possible of predictions for each soil type should be given. These include yield estimates of the adapted crops and carrying capacities of pastures under different important classes of management, management requirements for production and conservation, responses to drainage and other practices, and adapted varieties and strains of crops and grasses.

At this stage it may be practicable to hold a two- or three-day demonstration school at each sample area for agricultural advisers and others interested in learning how to recognize the several kinds of soil and to estimate their optimum use.

(e) After this initial publication, it may be best to proceed with (1) progressive soil surveys of large areas as a basis for general land use planning; (2) soil surveys of individual farms or groups of farms as needed to estimate the practicability of drainage, meadow improvement, cereal production, grazing-control schemes, and the like; or (3) some combination of these two alternatives.

4. Orderly expansion of the soil survey work should be provided for in the second year. Two firstclass graduates of the agricultural school, who have lived on farms, may be selected as technical assistants to be trained on the job to help with the survey work in the summer and to prepare final copies of the maps and make laboratory analyses during the winter. Further expansion after the second year should be determined on the basis of need to serve other farm programs looking toward soil improvement and more efficient soil use.

III. Soil management research.

1. As already pointed out, the soil survey program needs to be closely coordinated with the other soil research in the field and laboratory. The data obtained in the laboratory can be very helpful, but growing plants need to be used under the carefully controlled conditions of the greenhouse, and finally, plots need to be established in the field. Both field and laboratory work are underway, and will fit very nicely with the proposed soil survey. For optimum efficiency, greenhouse facilities should be provided as soon as possible, preferably immediately adjacent to the existing soil laboratory. Many possibilities may be developed or eliminated in the greenhouse at enormous savings as compared to field trials, which are expensive at best if the results are to be reliable.
2. A properly equipped experimental station on representative soil near Reykjavik is badly needed. This principal field research unit needs to be near the laboratories, libraries, and other services of the university area. Besides soil studies, work in field crop management and plant breeding needs

to be provided for. Plant breeding of cereals, grasses, forage legumes, and potatoes offers great possibilities, especially when correlated with soil selection and improved soil management. These professional workers at this main station would be in an excellent position to give general technical direction to the work at the other locations and to correlate the whole in terms of the different soil conditions and agricultural systems in the country.

A copy of this memorandum was also sent to each of the following:

Dr. Iver Nygard, Division of Soil Survey, St. Paul, Minnesota;

Dr. Bjorn Johannesson, University Research Institute, Reykjavik;

Mr. Joseph Mendenhall, ECA, American Legation, Reykjavik;

Mr. Ben Thibodeaux, ECA, Hotel Bedford, 17 Rue de l'Arcade, Paris;

and the ECA office in Washington, D. C.

September 2

In the morning, I go with Dr. Johannesson to his office. I see his library and a nice collection of base maps of Iceland. He shows me a fine Atlas at 1:100,000 and some additional maps at 1:50,000. Besides elevations, escarpments, and glaciers, these maps show: I. (1) cultivated ground, (2) meadow, (3) bog, (4) pasture; II. (1) wood and coppice, (2) heather, (3) swampy ground, (4) lichens and mosses, (5) rocky ground, (6) black lava, (7) stratified lava, (8) boulders, (9) pebbles, (10) gravel, (11) sand and dunes, and (12) clay. We discuss many of the points that I later incorporate into my memorandum to the Minister, and then go to lunch with Mr. H. Palsson, who is Head of the Agricultural Section of the University Research Institute. He is a sheep specialist. He thinks that overgrazing accelerates erosion only after it has started from natural causes. He says that in low-lying peat land, sand and other material cover the peat. Thin sandy soil well above the water table is likely to erode badly, as Palsson says he has seen in the high plateaux of northern Iceland. Old peat bogs that have become dry also are subject to erosion, but there are only small spots of these.

A late arrival to lunch is Mr. A. G. Eylands, who is interested in drainage and machinery.

I am told that farming in Iceland degenerated greatly during the war because of the high prices and wages in fishing and the high wages offered by the American and British.

Drainage and subsidies for land improvement and for a forest station are popular; it is very difficult, however, to get grants of money for research.

After lunch we first visit the Institute for Agricultural Pathology, Dr. B. Sigurdsson, Director. This beautiful station is financed in part by a grant by the Rockefeller Foundation. They are investigating several serious diseases of sheep, one of which is a chronic virus with a two-year incubation period. These diseases were apparently introduced accidentally with some sheep brought in from Central Europe. They also are studying another difficult one -- "sudden death" of cattle.

We hurry back to make ready for dinner chez Mendenhall (also Dr. Johannesson, Mr. and Mrs. Sober, Mr. and Mrs. E. Fridriksson, and Mr. Jessy).

There is much chit-chat about places, food, calories, furniture, and the like, and just a little serious discussion with Mendenhall about agricultural development in Iceland.

September 3 (Sunday)

This day promises to be cloudy and rainy, so we don't go into the field as planned. I spend most of the day preparing a first draft of my recommendations for the Minister of Agriculture and summarizing some of my notes.

We take a short walk to the museum and see some of the examples of early furniture, clothing, utensils, and the like, used by old Icelanders. We also visit a showing of extremely modern paintings by an Icelandic artist -- Davidsson (?). To me they are grotesque.

September 4

This is another rainy day. In the morning, I go to a conference with the Secretary of the Minister of Agriculture, Mr. G. Briens, and then with the Minister, Mr. H. Jonasson. He gives me a copy of the plan for an ammonium nitrate plant, as being proposed for ECA assistance.^{1/}

I discuss several of the points in my draft memorandum with him. He seems quite interested, and I believe the proposals will get serious attention. The Minister is quite an athlete. At one time he was the national wrestling champion. Now he is a most enthusiastic salmon fisherman. He tells me that his son is studying engineering at the University of Chicago.

After lunch we are taken to visit the President, Mr. Sveinn Bjornsson, at his farm (Bessastadir) by Mr. and Mrs. Eylands.

Although quite old, the President and his wife are very cordial indeed. They have a nice house on a good dairy farm. The President takes a keen and enthusiastic interest in the farm -- perhaps a bit too much. (I am not sure I should want to be his manager!) He is anxious to obtain seeds of corn (barley and oats) grown in Alaska, especially since he has read a recent press report about the wonderful success at Fairbanks with seeds brought back from Siberia by Mr. Henry Wallace.

^{1/} Added later: I found that this had not been well prepared; but the basic idea is sound.

We tour the farm in a cold, hard-driving rain. I try to get pictures, but I am afraid they won't be good.^{1/}

The President also insists that I talk with the men at the Keflavik Airport about how to grow better grass.

We have tea and shortly afterward drive back to Reykjavik. Because of our comment about the modern art we saw yesterday, it is insisted that we stop and see some of their really fine work done by the famous Icelandic sculptor, Einer Jonsson. It is arranged that we have a short visit.

I then have to go for a press conference with a group of reporters in the Foreign Ministry, arranged by the Officer of Public Affairs, B. Gudmundsson.

We have dinner between 7:00 and 8:00, and then are driven out to the Keflavik Airport, which is about 30 miles from Reykjavik. The road is rough. Nearly the whole of the way we pass over an undulating plain of broken lava. Here and there are a few patches, especially near the sea, with soil deep enough for grazing sheep. We reach the airport about 9:00, and I go out with Mr. Ahrene of the staff to look at the grasses. The grass needs more nitrogen and some brown spots are due to excess moistening in low spots in the grade. Dr. Johannesson leaves us, and we drink tea, while waiting to board the aircraft at 10:50.

^{1/} And they were not!

Besides our baggage, we have some samples of serum that Dr. Sigurdsson is very anxious for me to get to the Rockefeller Foundation as soon as possible.

We are in the air at 11:08 p.m. I work on my notes about Iceland as one day passes into another.

September 5

We are served coffee at 5:00 a.m., and are down at Gander in Newfoundland at 6:00 a.m.

After a short delay, we are again in the air for New York, and are down at the International Airport at 7:25 a.m., EDT. The passengers are herded into a "hold" room and left for a long time just to wait. We get through with the health and immigration officers about 8:05; but there is an enormous press at customs. I give the serum I brought at the request of Dr. Sigurdsson to the Public Health Officer and he agrees to keep it cold and to call Mr. Taylor of the International Health Division of the Rockefeller Institute.

Finally we get through customs and take the bus to La Guardia Airport with the hopes that we can get a plane to Washington soon. We are fortunate to get tickets on a flight to Washington at 10:05, that brings us to the Washington Airport at 11:27. Robert and Mary Alice meet us, and again it is good to be home.

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Statement on use of fertilizers in Holland
extracted from the Report on the Fourth
International Congress of Soil Science
developed by Dr. V. Ignatieff

Use of fertilizers and manures. Animal manures and composts from town refuse are utilized in the agriculture and horticulture of the country. In addition large quantities of commercial fertilizers are applied, both to the arable fields and some of the grasslands. The use of large quantities of commercial fertilizers is partly due to the small numbers of livestock kept on some of the arable farms. Fertilizers in the Netherlands are generally broadcast.

Examples of rates of fertilizer application. In the peat reclamation area of South East Groningen and South Eastern Drenthe the following crops are grown: Potatoes once every three years, oats, rye, some sugar-beets and seed flax.

30 - 50 tons per hectare of town compost are applied to potatoes. In addition the following rates of commercial fertilizers are used for this crop.

	<u>Plant nutrients</u>	<u>Kg per hectare</u>
Old reclaimed land	N	120
	P_2O_5	60 - 80
	K_2O	160
	2	
Newly reclaimed land	N	170 - 200
	P_2O_5	80
	K_2O	200
	2	
<u>For cereals:</u>		
Old reclaimed land	N	80 - 90
	P_2O_5	50 - 80
	K_2O	120
	2	
Newly reclaimed land	N	110
	P_2O_5	50 - 80
	K_2O	120 - 150
	2	

In the North-East Polder on half matured calcareous loam under-laid by a sandy loam on peat detritus, for wheat the following amounts of commercial fertilizers are used:

	<u>Plant nutrients</u>	<u>Kg per hectare</u>
After green manure crop	N	16
	P ₂ O ₅	30
Without green manure crop	N	80
	P ₂ O ₅	30

In the Province of Gelderland near Ottersum, the rotation practiced on a brown sandy river-loam is potatoes, rye, rye, oats.

Farmyard manure is used for potatoes and in addition the following amounts of commercial fertilizers are applied:

<u>Plant nutrients</u>	<u>Kg per hectare</u>
N	140
P ₂ O ₅	200
K ₂ O	200

For rye, commercial fertilizers are applied at the following rates: -

<u>Plant nutrients</u>	<u>Kg per hectare</u>
N	70
P ₂ O ₅	100
K ₂ O	100

Near Beuningen there are areas of old arable land of Roman times which has been covered by alluvium of more recent origin. The soil is a fine sandy clay, high in iron phosphate, especially near the sites of ancient villages. The land is used for orchards, grass and arable crops, potatoes, wheat and oats.

Farmyard manure is applied to potatoes and commercial fertilizers are used for potatoes and cereals as follows:

In the North-East Polder on half matured calcareous loam under-
lain by a sandy loam on peat detritus, for wheat the following amounts
of commercial fertilizers are used:

Plant nutrients		Kg per hectare	
N	P ₂ O ₅	S	After green manure crop
			15
			30
N	P ₂ O ₅	S	Without green manure crop
			80
			30

In the Province of Gelderland near Ottersum, the rotation practiced
on a brown sandy river-loam is potatoes, rye, oats.
Farmyard manure is used for potatoes and in addition the follow-
ing amounts of commercial fertilizers are applied:

Plant nutrients		Kg per hectare	
N	P ₂ O ₅	K ₂ O	150
			200
			200

For rye, commercial fertilizers are applied at the following rates:-

Plant nutrients		Kg per hectare	
N	P ₂ O ₅	K ₂ O	70
			100
			100

Near Bunnigen there are areas of old arable land of Roman times
which has been covered by alluvium of more recent origin. The soil is
a fine sandy clay, high in iron phosphate, especially near the sites of
ancient villages. The land is used for orchards, grass and arable crops,
potatoes, wheat and oats.
Farmyard manure is applied to potatoes and commercial fertilizers
are used for potatoes and cereals as follows:

	<u>Plant nutrients</u>	<u>Kg per hectare</u>
Potatoes	N	150
	K ₂ O	200
Cereals	N	60 - 80
	K ₂ O	100

Near Kesteren commercial orchards of apples, plums, pears and cherries are grown. Some of the better soils are the light to moderately heavy river ridge clays on clayey sand. The fertilizers are uniformly applied over the whole orchard area and the annual rates of application are:

	<u>Plant nutrients</u>	<u>Kg per hectare</u>
	N	250
	P ₂ O ₅	100
	K ₂ O	250

In the Westland between Rotterdam and the Haig there is an area in which market garden crops are grown in the open and under glass and fruits such as grapes and peaches are raised in greenhouses. Large quantities of commercial fertilizers are used for these crops. For instance on dune-sands for two successive crops under glass of cauliflower and tomatoes, the following quantities of plant nutrients are applied:

	<u>Plant nutrients</u> <u>Kg per hectare</u>		
	<u>First Crop</u>	<u>Second Crop</u>	<u>Total</u>
N	200	150	350
P ₂ O ₅	200		200
K ₂ O	250	175	425

Plant nutrients kg per hectare

Potatoes	N	150
	K ₂ O	200
Cereals	N	60 - 80
	K ₂ O	100

Near Eastern commercial orchards of apples, pines, pears and cherries are grown. Some of the better soils are the light to medium heavy river ridge clays on clayey sand. The fertilizers are uniformly applied over the whole orchard area and the annual rates of application are:

Plant nutrients kg per hectare

N	250
P ₂ O ₅	100
K ₂ O	250

In the Westland between Rotterdam and the Hail there is an area in which market garden crops are grown in the open and under glass and fruits such as grapes and peaches are raised in greenhouses. Large quantities of commercial fertilizers are used for these crops. For instance on dune-sands for two successive crops under glass of cauliflower and tomatoes, the following quantities of plant nutrients are applied:

Plant nutrients kg per hectare

	First Crop	Second Crop	Total
N	200	150	350
P ₂ O ₅	200		200
K ₂ O	250	150	400

COMMERCIAL FERTILIZER

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GREEN
BOOK

October, November, December, 1950

NOTES FROM EUROPEAN FIELDS

SPECIAL TO COMMERCIAL FERTILIZER

By CHARLES E. KELLOGG

Chief, Division of Soil Survey, U. S. Department of Agriculture

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SPECIAL TO COMMERCIAL FERTILIZER

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Chief, Division of Soil Survey, U. S. Department of Agriculture

Shannon, Ireland

July 2, 1950

Ireland has a high proportion of good soils. As Dr. Thomas Walsh, the chief soils officer of the Ministry of Agriculture says, perhaps they are almost too good! What he means is that Irish farmers have been getting fair to good yields for so long that they don't realize how much more they could really get by optimum use of lime and fertilizers.

He points out, for example, that Ireland now uses only 250 thousand tons of ground limestone annually, yet needs at least one million tons, besides an initial application of around 15 million tons. Yields are seriously curtailed on roughly 90 percent of the crop and pasture land from lack of phosphates. The figure for potash is about 50 percent. Where farmers have supplied minerals according to need, their yields of tillage crops and pasture are fully 2 or 3 times the average.

The scientific services in the Agricultural Ministry are developing in good hands and the Minister himself, Mr. Dillon, is keenly aware of what science can do for the farmer. And he is doing something about it. He has plans for extension work to follow up the experimental

work too. As he put it: "We must have enough instructors ("county agents") so that each farmer can plan his farm. If an instructor becomes confused with a problem, he can immediately call on our research scientists; and if they get stuck, we shall send them to Beltsville or anywhere else in the world where the answer may be found. We want every farmer in Ireland to have the results of scientific research everywhere."

Things are moving in Ireland. Of course, anyone who has worked with farmers knows that farm plans cannot be made overnight. Farmers must first be shown results.

Then too, farmers must have the materials to do the job—machines for the small farm, electric power, fertilizers, good seeds, and the like. A big increase in fertilizer is needed. Except along the very coast where seaweed can be used, potash must be brought in. Considerable deposits of hard phosphate rock exist in County Clare. These need to be developed. Sulphuric acid does not work satisfactorily. Possibly the olivine fusion process will work better. Electric power can be had from the Shannon hydro-electric system. Phosphate im-

ports need to be stepped up more. Ground rock phosphate does well on the acid soils but many of the Brown Forest soils are too alkaline for rock.

Besides fertilizers, a lot of land needs drainage. Clearing of stones and hedges will also make some new farms that can be used in the modern way. A land reclamation scheme is under way that will provide the big machines to handle these jobs. Yet for economical use of the soil, fertilizers are needed as much or more on the good free-draining land as on this reclaimed land.

Research work is going forward in fertilizer placement, grass mixtures, time of seeding, and all the rest. During the past 5 years Dr. Walsh has increased his professional staff 6 or 7 fold. The modern soil-testing laboratory at Johnstown Castle ran some 50 thousand soil samples last year and will need to take care of at least 100 thousand this year.

I saw old pastures being plowed for the first time in recorded farm history to get fertilizers into the soil and to sow the proper seeds. Green Ireland is becoming greener!

Fortunately, they in Ireland compare their results with our best in the United States. The

Irish agriculturists scarcely realize how much better their poorest farms are than our poorest ones. I am sure we shall have much to learn in America from their experiences.

Lisbon, Portugal

July 8, 1950

Farming goes better in Portugal now than during the war. Yet there is a long way ahead before it is as efficient and productive as it could be. Especially in the north, farms are too small. Some way must be found to give part of the farm people jobs in industry, and to enlarge the farms, thus making scientific methods possible.

A good start has been made in research at the Estacao Agromica Nacional at Sacavem—the Plant Industry Station of Portugal. It was founded in 1937 and in its present site in 1941. Dr. A. Camara, Director of the station, is himself a distinguished scientist. He has an excellent nucleus of staff, but unfortunately, the budget of the station has not even kept pace with inflation, let alone with the growing needs of the agricultural economy. Probably this situation is temporary. Anyway Portugal has a firm base on which to build the agricultural research which is absolutely essential to productive agriculture, both in Portugal and in its African colonies.

The Ministry of Economy hopes to revitalize its agricultural extension program, partly through cooperation with the United States by visits of "county agents" to our country. Everyone agrees that both re-



Dr. Kellogg

search and advisory services need expansion together. The well developed cooperation between scientists and advisors in many of our State Land Grant Colleges will be especially helpful to them. One never quite appreciates how effective this cooperation is until he visits a country where it has not yet developed.

The soil survey staff is small but excellent. A very good beginning has been made, with both a new general map of the whole country and a few detailed surveys. Mr. Luis Bramao, in charge of the soil research, showed me a new one for an area north of Lisbon that came out only last week. With this well trained staff, Portugal can and should go ahead and complete the soil survey. It is an essential base for both research and extension, especially here where every acre of good soil needs to be used and where the kinds of soil vary so widely in management requirements.

In Portugal itself, most of the

soil suitable for crops and pasture is already used. Some new land will come under irrigation soon. But part of the soil now cultivated would probably be more productive under pine and cork oak forest.

Production could be greatly increased on the soil now farmed, probably more than doubled. Some soils have been badly eroded in years gone by; but the control of erosion now going on is fairly simple, provided the soil is kept productive. The problem of the small farm must be dealt with. More fertilizers are badly needed and lime too, especially in the north. Better machines are required. Now they cost the farmer too much.

The problem of parallel development of agriculture and industry so important in many countries besides Portugal, is admittedly difficult, even after the scientific phases of the problems are well understood. But Portugal is fortunate in having large colonies in Africa that have great resources. These are only partly developed but can be made to produce far more, and in ways that will supplement the economy of the home country.

I was especially impressed by Mr. La Carneiro's understanding of the agricultural and industrial potentialities of Africa and how they may be used to benefit the people of both Portugal and the African colonies.

Probably more Portuguese will find economic opportunity in Africa. But mainly, the raw materials of Africa will be needed for expanded industry at home as unneeded rural workers are transferred to manufacturing.

NOTES FROM EUROPEAN FIELDS

SPECIAL TO COMMERCIAL FERTILIZER

By CHARLES E. KELLOGG

Chief, Division of Soil Survey, U. S. Department of Agriculture

Paris, July 17

So far as this visitor can see, agriculture in France has completely recovered from the war. But recovery is not enough. The problem now is not one of rehabilitation but one of expansion and development as an essential part of a higher general level of production—a level that must be reached if Western Europe is to have stable governments.

France has the potentialities, in her soil and in the genius of her people. But — and this is a big but — how to develop them? Although nearly one-half of the people live on farms, agriculture has a low social status in the minds of many French people, even of officials of the government. Bright young farm boys choose to be engineers, lawyers, and physicians, not soil scientists, agronomists, or plant pathologists.

Besides, the agricultural research services are wholly inadequate in size, scope, and financial support. Probably there are no more competent soil scientists operating in all metropolitan France than in one good American Land Grant College! Other agricultural research services are similarly staffed.

Although the need for a more effective extension service for farmers is being recognized, the

research services must also be greatly expanded or the extension program will be superficial and likely to fail. French farmers, for example, can increase yields of crops and pasture and efficiency of production by increased fertilization. But now there are not nearly enough experimental plots nor an adequate program of soil classification and mapping upon which to base recommendations and soil testing services. A part of the French farmers on the most productive soils are well informed and highly efficient. Although they are too few, they indicate clearly what can be done.

Some American agriculturists get the impression that the French scientists are too isolated from the farmers. This is true; but it is not necessarily the fault of the scientists, who find themselves scattered among many separate administrations, as much as of organization. We in the United States take for granted the excellent coordination of research and extension in agriculture, due primarily to our splendid Land Grant colleges. Our result is due largely to our organization and to the public support for research and advisory services, rather than to better individual scientists.

Then too, the French say "pedologist" rather than "soil

scientist," not to be erudite but mainly because of the exalted connotation of the word "scientist" (*savant*). A Frenchman could scarcely refer to himself as a "scientist."

Interestingly, scientific research and advanced teaching basic to agriculture are making better progress in the French colonies than in France itself, especially in the Office de la Recherche Scientifique Outre-Mer.

Besides the work of individuals and groups within the colonial ministries of France, Britain, and Belgium, research results and experiences in Africa below the Sahara are being exchanged and correlated. Excellent beginnings for working together are underway. Through this combined effort, the outlook for improved tropical agriculture has brightened a great deal in the past two years. Principles being developed in Africa will, of course, be applicable to all the tropics. Perhaps this research development in Africa may grow into one of the brightest spots in the forward world food picture.

One can only hope that the leaders in France will see the greater agricultural potentialities and push forward vigorously now, while there is time, for the good of France and of the

whole community of Western Europe.

Netherlands, August 5

The Fourth International Congress of Soil Science in Amsterdam (July 24-August 1) has been a great success. Over 600 soil scientists from countries all over the world took an active part in the program. The Dutch Committee did an excellent job in arranging the meetings and especially in planning a post-Congress tour where we are now seeing soil science put to work to an amazing degree.

The program of scientific papers and the discussions emphasized the need for more frequent general meetings. (The last Congress was held 15 years ago in Britain.) As soil science grows up and more general principles are developed — principles that fit the experiences from the field, from the experimental plot, and from the laboratory — many apparent conflicts need to be resolved. Such conflicts are especially pointed up in soil classification and in its interpretation into land classification. The Dutch themselves have a lot of experience to contribute to these discussions. Professor Dr. C. H. Edelman, President of the Congress, is himself Director of the Soil Survey Institute, centered at Wageningen. Then too, soil classification is a basic first requirement for land development in the polders and for the reallocation of tiny strips around the old villages into units of manageable size.

The program on clay minerals was especially good. What began as mainly fundamental scientific inquiry is now contribu-

ting substantially to practical problems of soil classification and management. Tropical soils received special attention. But perhaps it is misleading to single out these topics since the program covered all fields of soil science and the Proceedings of the Congress will be of great interest to all soil scientists. (These may be obtained from the Secretary, Dr. P. A. Rowaan at Groningen.)

Besides the scientific papers, at this Congress it was necessary to revise the Constitution of the International Society of Soil Science and get it going after its interruption in 1939 by the war. Based upon draft rules prepared by several national societies and debated at the Congress, a new set of rules were approved. The Society will not now publish a scientific journal as it did formerly but will publish an information bulletin at regular intervals giving all members an opportunity to know who is doing what and where.

A decision was taken to accept an invitation to hold the Fifth International Congress at Leopoldville in the Belgian Congo in 1954. This decision was partly in response to a long-standing need to have a meeting in a tropical area since all the others have been in temperate regions. In accordance with the rules, Professor Dr. R. Taver-
nier of Ghent in Belgium was elected president of the Society and Mr. F. Jurion, Director-General of INEAC (the agricultural research organization of the Belgian Congo) was elected vice-president. Dr. W. R. Domingo, Oosterbeek, Netherlands, was chosen to be secretary-treasurer. The Congress voted to recom-

mend that the Council of the Society attempt to arrange for the Sixth International Congress in France at a time and place agreeable to the Society and to the Government of France. Also, consideration is to be given to a special meeting of Commission IV, on soil fertility and plant nutrition, in Eire during the summer of 1952 if practicable. The proposed program would center around problems of applied research for obtaining satisfactory methods to use in supporting advisory programs on fertilizer use for optimum crop production.

The Society also elected officers for the several technical commissions and representatives of individual members on the governing council. Other council members remain to be chosen by the several national societies of soil science where they exist and have 20 or more members affiliated with the International Society.

The reorganization of the International Society of Soil Science is a great thing for our work. It merits the support of every worker in the field. (And it will likely cost only about one dollar a year besides the Congress fees.)

As a distinguished American colleague, Dr. Richard Bradfield of Cornell, put it, "The knowledge we get from others is the cheapest information we can come by."

NOTES FROM EUROPEAN FIELDS

SPECIAL TO COMMERCIAL FERTILIZER

By CHARLES E. KELLOGG

Chief, Division of Soil Survey, U. S. Department of Agriculture

Breda, The Netherlands.

August 12

The Dutch soil scientists carried out an exceedingly well-planned tour of their country following the Fourth International Congress of Soil Science ending August 1.

Throughout the country one is continually amazed at the rich agriculture from soil literally made by drainage, diking, fertilizing, and good husbandry. So much has been made from an abundance of water, a great deal of sweat, and only a little earth! The polders are outstanding achievements of engineering, soil science, administration, and good husbandry, all combined. We were shown very old ones, new ones, others under construction, and some being remade after wartime flooding with sea water.

Further increases in efficiency in many of the old agricultural communities depend upon consolidation of the tiny parcels resulting from ancient divisions and subsequent splitting by inheritance into convenient economic units. Already projects are under way for re-allotment based primarily upon detailed soil maps and plans for improved drainage and road systems. These programs are vitally needed, but must be carried forward very carefully under law

with full discussion and consultation among owners and tenants so that all are treated fairly in the final readjustments.

Fertilizer use is very high in the Netherlands—perhaps the highest in the world for special crops grown with intensive control of the ground water. Tomatoes, peaches, grapes, and a few other crops are grown in glass houses built over the field in soil in which the crops are rooted. But cereals, sugar beets, and meadows also receive high rates of fertilization. Rates go up to 400 pounds of nitrogen per acre, 600 pounds of P_2O_5 , and 600 pounds of K_2O , and higher. An intensive fruit and vegetable farm of 7 to 8 acres, half under glass, may represent an investment of nearly two million guilders or about three-quarter million dollars.

The intensive horticultural development is very closely related to soil conditions. One can see why such farmers are especially aware of soil differences and enthusiastic users of soil maps. Only a few inches variation in the depth to which the water table may be controlled determines success or failure. Many crops as well as grass are grown in the Netherlands on soils that would be regarded in the United States as too shallow over the water table. But the essential point is its control. If

the water table is near the soil surface for part of the time and deep part of the time, the Dutch farmer doesn't want the land; but it can be quite near the surface and many crops grown successfully if it is maintained at a constant level. The extent to which they have been able to control it with canals and tile for both drainage and subirrigation is remarkable.

Important areas of sandy soils have been made productive by removing the sand from high areas and spreading it on the low ones. Some soils have been cut down as much as 20 feet and others built up two or three feet. Many other examples of man-made soils may be seen. In tidal flats near the sea, ditches are dug to catch the silt brought in by the tides which is then thrown up in beds (like the age-old practice of warping in eastern England). Elsewhere the land was treated for centuries with manure composted with heather sod containing fine sand. Now the arable land has a dark-colored surface soil some 18 to 24 inches deep instead of only four or five.

Through their recent researches, Prof. Dr. C. H. Edelman and his associates in the Netherlands Soil Survey have worked out the genesis of many of the productive arable soils

that have been drastically altered through various methods of this sort since before Roman times down to the present day.

The reclamation of Walcheren Island, flooded by sea water during the liberation in 1944-45, is an outstanding demonstration of applied soil science. Re-allotment, improved drainage, removal of salts, rebuilding of roads and houses, and all the rest are going forward together. It is a big job, but the soil of Walcheren Island, much of it below sea level, will undoubtedly soon be producing more than ever before.

Now one sees in the Netherlands a beautiful, well-ordered agricultural country. Most of it has been built up by the people themselves from marshland, tidal flats, sandy heather Podzols, sand dunes, and river beds. Should one estimate potential world food production on the basis of what the Dutch engineers and agriculturists have done, the figures would be astronomical beyond conception. Has it been economic? No one can tell. By the usual method of calculating costs and returns, certainly not (even after allowing generous "multiplier factors" for the benefits to those who serve agricultural people). That is, one may get the cost figures, the man-work days, and the production and show easily that the work has all been uneconomical. But still there are the beautiful soils, the efficient farms, the pretty villages, and a thriving nation of some 10 million people.

Brussels, Belgium, August 20

Following the Fourth International Congress of Soil Science and the excursion in Holland, a week's tour in their country was arranged by the Belgian soil scientists. Since the polders in Belgium are like those in Holland, the tour was planned for the uplands, especially the sandy plains near Ghent and the rolling lands covered with loess east and southeast of Brussels.

These upland soils from loess resemble some of the light-colored soils from loess in the general region common to Illinois, Iowa, Minnesota, and Wisconsin. But in Belgium one does not find the soils with claypans in the nearly flat uplands.

In many ways besides position, Belgium is intermediate between the Netherlands and France. Part of the soils are very like those in the Netherlands and the soil survey staffs of the two countries work closely together for their classification and interpretation. The



Dr. Kellogg

"loessial loams" are similar to those of northern France in the vicinity of Paris and north. Part of the people speak French and part Flemish or Dutch. Some of the living ways suggest Netherlands, and others France. But Belgium is by no means simply an "intermediate" country. It has its own cultural pattern.

Much of the farming in Belgium is still traditional. In some areas, for example, farmers have used lime for a long, long time and in fact use a bit too much now. In other villages, too little lime is used. Fertilizer use and cropping systems in some villages are similarly related to history. Although good reasons can be found in the past for many of the existing systems, often these are no longer valid.

The re-allotment of the many tiny separate parcels under individual management into single consolidated farms is, perhaps, the most pressing agricultural need in Belgium. Highly intricate patterns in many parts of the country have grown up from ancient times, reflecting medieval village rights, various sorts of divisions, and subsequent splitting by inheritance. Although there are important local exceptions, most Belgian farmers live in villages and go out to their scattered parcels. These are difficult to fence and to get at. Many are too small for using machinery most effectively. Some of the soils from loess, for example, are now used for wheat with good yields; yet they would produce even more under efficient mixed farming.

Until fairly recent years, only a little soil research had been



done in Belgium and that mostly at Louvain. Now work is going forward at Ghent and Gembloux as well. The soil survey is cooperative among the three centers under financial support from IRSIA (Institut pour l' Encouragement de la Recherche Scientific dans l' Industrie et l'Agricultur) and with the technical guidance of Prof. R. Tavernier, Professor at Ghent and the new president of the International Society of Soil Science. Although only begun recently, the work is proceeding very well indeed. As in the Netherlands, soil classification in Belgium needs to be highly detailed and to take full account of soil characteristics due to long use as well as to the purely "natural" characteristics.

In the loessial area, the Belgian soil scientists showed some very interesting results of their research—soil types produced through modification of the natural soil by geomorphological processes, including very gradual accelerated erosion, stimulated by cultivation, and by other

processes related to very long use of the land.

Besides the recent emphasis given soil research in Belgium itself, a large expansion is going forward in the Belgian Congo under INEAC (Institut National pour l' Etude Agronomique du Congo Belge). The Director General, F. Jurion, is also vice-president of the Society and will have the chief responsibility for organizing the Fifth International Congress of Soil Science, scheduled for 1954 in Leopoldville. INEAC has some 26 experimental stations in the Congo. Some initial soil surveys have been made. Three extensive ones are planned for the immediate future with a corresponding expansion of correlative laboratory and field research. Additional staff members are coming to the United States for advanced study and some opportunity will likely develop for American soil scientists to work in the Congo. The main station at Yangambi was recently chosen as the central headquarters for coopera-

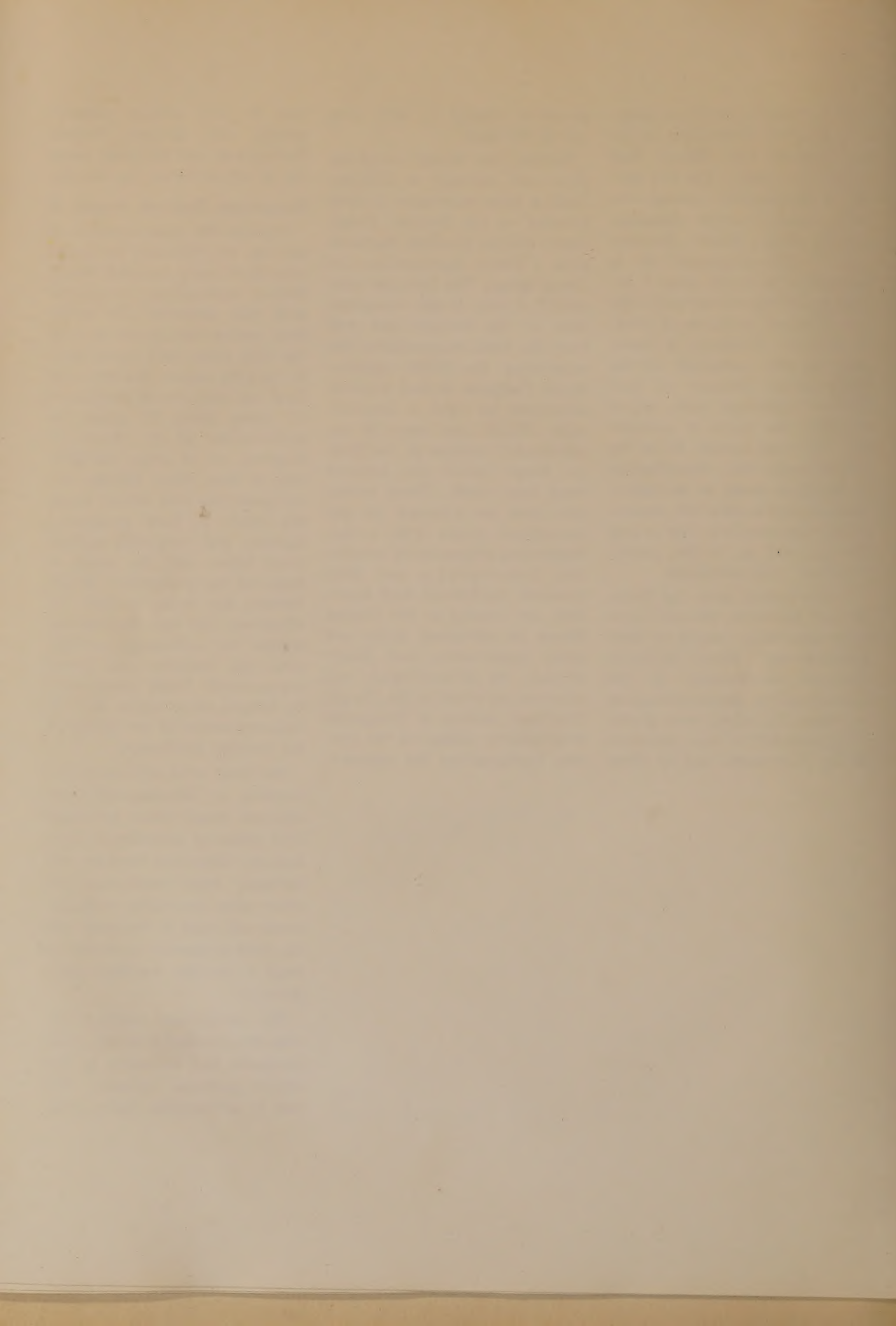
tion in soil science research among the British, French, Portuguese, and Belgians working in Africa below the Sahara.

Harpenden, England, August 27

Perhaps the basic question of soil use in Britain is the broad one: How much can and should British agriculture compete with that overseas? The industrial system has grown up over the long years with cheap food. In varying degree, the imported food has been cheap because of (1) cheap labor, (2) quick soil exploitation, or (3) greater efficiency, or of some combination of these three. Britain cannot meet the first two of these: she needs to have prosperous farmers and well-paid agricultural labor, and she needs to keep her soil productive. British farmers are trying to meet the efficiency, and can. But the demands for efficiency conflict with old customs and living ways—small fields surrounded by hedges, stone fences, and the leisurely habits of the old sporting country gentlemen.

Yet even with efficiency, fair incomes to farmers and farm laborers mean either increased food prices or subsidies to agriculture. Otherwise farmers will decrease their production, do other more rewarding work, imports will need to increase; and the food production potential to meet a possible wartime crisis decrease.

The government needs to decide this balance between price increases and subsidies in the whole national interest, and how to set subsidies fairly with-



out perpetuating inefficient production methods.

Progress has been relatively rapid considering the traditional background of farming. Before the war, British farmers furnished about one-third of the food needed; in a couple of years they will be producing one-half of it, or possibly a bit more. Increased mechanization, more use of fertilizers, better fitting of crops and soil management practices to local soil types, and especially improved farm management systems with more economic use of labor, land, and materials need special emphasis. Toward these ends both research and advisory services are expanding to meet the needs of the farmers.

Agricultural development is also receiving emphasis in the colonies. Difficulties arising from poor planning in the great "groundnut (peanut) scheme" of East Africa have stimulated interest in African potentialities and, it is hoped, taught high-level administrators that agricultural settlement is a highly technical business.¹ In the beginning, the Ministry of Food didn't even seek the services of the able soil scientists in Britain itself who could have saved them much later embarrassment. But it appears that the lesson, even though very expensive, has been learned. Within the Colonial Office itself, and available to it through several research institutes, are highly skilled soil scientists and other agricultur-

ists who can plan for steady economic expansion in Africa of great benefit to both Britain and the native people in the territories. But progress does not lie along the lines of gigantic schemes for individual crops, of course, but for combinations of food crops, industrial crops, and livestock in communities where the other resources—forests, water, and minerals—are also appropriately developed. A well-planned program of planimetric surveys, based on aerial photographs, with provisions for topographic, hydrologic, geological, and soil surveys is under way.

Finally, one must emphasize the cordial and effective working relationships between British and American soil scientists and other agriculturists. The results of research in either country are used fully in the other as much as if the work were jointly administered. Cooperation extends to Africa as well as in Britain itself. We may expect more British soil scientists in the United States and opportunities for American soil scientists to study in Britain and Africa. Such cooperation more than doubles the results for all.

Reykjavik, Iceland September 4

Many Americans have recently discovered Iceland, and more will certainly do so now that it offers a convenient stopover on regular flights to Europe. The country offers a unique combination of the quaint and the bold. The scenery is too big to be spoiled by commercialism even if anyone tried, and no one has.

Besides very bright green

fields and grassy plains and hillsides, there are wind-swept stretches of volcanic lava and cinders and rugged mountains with living glaciers in the high places, although permanent ice and snow covers only eight percent of the country.

The whole of the country has been formed from volcanic ejecta. Most of this is very old, even before the last glacial period (12,000 years or so ago), but small eruptions occur now and then. Mt. Heckla, the most active volcano, gave a dramatic show in 1947. There are many boiling mud pots and hot springs. Some farms and many glass houses are heated with this water, and considerably more than one-half of Reykjavik, a modern capital city of 55,000, is heated this way.

The population stands at about 135,000 for the whole country. Slightly less than one-third of the people live on farms, on some 6,000 of them in various parts of the island, not counting part-time farmers. Perhaps another one-third live directly or indirectly from the fishing industry. (Iceland sits in the midst of some of the richest fishing waters in the world.) Others are employed in many small secondary industries based partly on local products and more on imported raw material.

The Icelanders are a modern people, in basic cultural values perhaps more like Americans than Europeans, willing to take chances and to break traditions, but speaking the old language of the Vikings, now preserved only in books of old Norse and among these lively folks.

Icelanders love flowers and

¹/ Those interested in this controversial scheme will find a good treatment in *The groundnut affair* by Alan Wood. The Bodley Head, London. 1950.

books. Most houses have plants and a great many have a wide variety of flowers and vines inside. Certainly there are more book stores in Reykjavik by far than in any other city of comparable size in the world. No illiteracy exists in Iceland.

The basis of Iceland agriculture is grass—both improved grassland and range. Here the improved grassland (tun) used for hay and pasture is regarded as arable or cultivated land, even though rarely plowed after breaking. Now it amounts to somewhat over 100,000 acres. Around 2,000 acres are used for intertilled crops—potatoes, turnips, and vegetables like cabbage, cauliflower, carrots, and lettuce. The improved land is now increasing at about 2,500 or more acres annually. Responsive soil is available for a large increase; but no one knows just how much. Plans for soil classification and mapping are being made now, partly to guide this expansion and partly as a basis for differential recommendations on drainage, fertilization, and cropping on the different types of soil.

Small grains, oats and barley, are now grown a little on the earliest-warming mineral soils. Probably they can be greatly increased by proper soil selection, fertilization to hasten early growth and final maturity, and the sowing of adapted varieties. At first at least, success will be most likely on fully mechanized special farms where seeding may be done as early as possible and with facilities for drying the grain after harvest.

Oats and oats and peas together are used for forage, especially during the first one to three years on new, reclaimed peaty soils.

Iceland has hardy native breeds of sheep, dairy cattle, and small horses or ponies. Unfortunately, three new sheep diseases, of which two are quite serious, were accidentally introduced about 15 years ago. Intense pathological researches are underway, but no successful treatment has been discovered. The affected areas are quarantined and the diseases are fairly well checked.

Considering the small acreage of improved land and the recency of introduction, fertilizer use is very high. On a well-managed dairy farm near Reykjavik, for example, an annual application of 65 pounds of N, 50 pounds of P_2O_5 , and 50 pounds of K_2O per acre is used on grass. Some farmers use nitrogen and farmyard manure on the improved grassland. But many soil types are especially deficient in phosphorus, which becomes noticeable as soon as nitrogen fertilizer is used. For potatoes, larger amounts are used, say 120 pounds of N, 120 pounds of P_2O_5 , and 180 pounds of K_2O per acre. But, of course, the amounts and ratios used vary with the type of soil.

Iceland has considerable serious soil erosion. Probably the larger part of this is the normal result of slipping on hillsides and blowing of yet unstabilized ash and cinders. Frost action is especially severe because of the alternate freezing and thawing

in winter. Certainly a great deal of the erosion has been accelerated by overgrazing, especially with sheep, and on soils so deficient in nitrogen and phosphorus that vegetation returns only very slowly on the slip scars or after its destruction by hot ashes. Orderly study is urgently needed to make possible accurate estimates of the optimum carrying capacity of different types of soil as a basis for better control of grazing. Although all shades of opinion are articulate, no one knows how much of the erosion is normal and how much accelerated.

Beginning about 20 years ago, hot water from the thermal springs is used for heating glass houses. Now about 17 acres are under glass, and much more can and will be developed. Nearly one-half of the space is used for flowers. Tomatoes and cucumbers occupy the remainder, except for a few grapes and even bananas.

During the war and immediately afterward, fishing was so profitable to Iceland that it neglected its agriculture. This is now seen as a great mistake. Research and advisory services are being strengthened as a basis for orderly reclamation and soil improvement. The very security of the nation depends on it.

